Appendix A2

East Dike Construction Evaluation

Email Correspondence

Report: ***Meadowbank Gold Mine Second Portage Lake ChitoVan LC Field Application and Monitoring, Meadowbank Gold Mine, Nunavut***

Report: ***Aquatic Effects Monitoring Program – Targeted Study: Dike Construction Monitoring 2008, Meadowbank Gold Project***

Report: ***Control of Suspended Solids At Second and Third Portage Lakes – Construction of East, South Camp and Bay-Goose Dikes – Meadowbank Gold Project, Nunavut***

From: Larry Connell
Sent: Wednesday, August 13, 2008 9:57 AM
To: Richard Dwyer; Andrew Keim; Liu, Amy; Stephen Hartman
Cc: Denis Gourde; Sylvain Doire; Rachel Gould; Randy Baker
Subject: Meadowbank Project - Notice of Indefinite Suspension of East Dike Construction pending Reduction of Turbidity at Station SE3
Attachments: Water Column Turbidity Interpretation_Aug 12.pdf

All:

Please be advised that AEM suspended construction of the Meadowbank East Dewatering Dike starting August 11th for an indefinite period to allow turbidity levels to be reduced at Monitoring Station SE3.

The turbidity 7-day moving average at sample location SE3 exceeded the "action threshold" as defined in Section 5 of the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering at the Meadowbank Mine starting on Saturday August 09th. At all other monitoring stations the 7 day moving average is well below the action threshold. This is the first occurrence of an action threshold exceedance since construction was started on July 30th. In accordance with the Plan, AEM initiated the following actions:

- The turbidity barriers were adjusted and lowered in close proximity to Station SE3;
- Rate of rockfill placement was cut to 50% on dayshift and halted completely on night shift. Rockfill was sourced on dayshift from a pile that appeared to contain more coarse materials. On August 10th the source rock was being washed in situ prior to excavation to remove surface fines to reduce silt introduced with the rockfill placed into the water
- Rate of placement was reduced by another 50 % to 5,000 t/shift for both dayshift and nightshift

The August 10th daily reading of turbidity decreased but not enough to bring the 7 day moving average back under the action threshold. The rate of placement was held at a low rate.

The August 11th daily reading of turbidity showed no major decrease nor increase consequently the 7 day moving average is again just over the action threshold (17.4 versus 15). AEM suspended all further rockfill placement and continues to monitor turbidity at SE3. The construction activity continued to be suspended through August 12th and into August 13th.

The following complicating factors should be noted:

- Wind speed changed direction and increased significantly on August 08th just preceding the rise to turbidity levels measured at SE3
- The East dike construction is currently passing through the deepest point (water depth) along the alignment and this may be contributing to increased turbidity

AEM is continuing to monitor this situation and adjusting construction accordingly to manage turbidity levels in Second Portage Lake.

Please find attached a short memo from Azimuth providing their interpretation of the current turbidity resulting from this construction. AEM has retained Azimuth to be its onsite monitor of turbidity and TSS during construction of the East Dike.

Regards

From: Larry Connell

Sent: Friday, August 15, 2008 10:38 AM

To: Richard Dwyer; Andrew Keim; <Hartman Stephen; Liu, Amy; Wilson,Anne [Yel]; craig.broome@EC.GC.ca

Cc: Denis Gourde; Sylvain Doire; Rachel Gould; Randy Baker

Subject: Meadowbank Project - Status Update on Constructoion of the East Dewatering Dike

Attachments: Water Column Turbidity Interpretation_Update Aug_14.doc; Turbidity Map.ppt

All:

The following is an update to the status of construction of the Meadowbank East Dewatering Dike and our associated turbidity issues in Second Portage Lake.

- As per my last email we suspended rockfill placement on August 11th for 24 hours to allow some time for turbidity levels to decrease at Monitoring Station SE3;
- We restarted rockfill placement on August 12th with a reduced targeted placement rate of 10,000 TPD. We saw no change in turbidity (no decrease or increase) resulting from this resumption however it should be noted that high winds and stormy conditions have been prevalent at Second Portage Lake throughout this week long period.
- Turbidity levels continued to be above the “action” level at SE3 and were noted to be rising at SE2. Rockfill placement was again suspended on August 13th at 06:00 hours and then resumed at noon. We are continuing to place rockfill and are anticipating that we can reach the north shore thus closing off the opening with a rockfill barrier by tomorrow Saturday August 16th.

Azimuth has continued to monitor turbidity conditions on our behalf within Second Portage Lake although poor weather has hampered continuous coverage (we have had to pull off the lake for several periods due to rough water). Turbidity conditions have not substantially changed since August 13th with one exception. Station SE2 while still exceeding the 7-day average, also exceeded the 24-hour maximum threshold. This is because sampling occurred in slightly deeper water and because Azimuth encountered the turbidity plume east of SE3 (see attached technical note). Because maximum turbidity was 1,300 NTU, the 24-hr maximum was exceeded. We still have 24-hour and weekly exceedances at SE3 and we anticipate that this will not change in the foreseeable future. Station HVH3 east of SE3 continues to exceed the weekly threshold.

Azimuth noted that turbidity inside the silt curtain at a depth of greater than 3 m is 1500+NTU; so there is a large pool of TSS contained within the silt curtain. However, once the silt curtains are removed before winter, this turbid water will be released to the lake. Azimuth recommend that the downstream (impoundment side) silt curtain be removed well before the upstream side silt curtain to allow sediment to be released into the fish out side of the lake, to minimize impacts to lake-side habitat. AEM will comply with this recommendation but it should be noted that this barrier will only be removed once the East Dike cutoff wall is complete.

Azimuth sampled the deeper (13 m) basin west of the east dike and found only moderately high turbidity (33 NTU) at the bottom. They could find no evidence of a highly turbid bottom plume west of the dike. Turbidity continued to diminish northwest up the lake with turbidity levels of ~25 NTU half way up the lake and 13 NTU at the north end. When weather improves, Azimuth will continue stepping out to verify the extent of the two sediment plumes in deeper water north and south of the east dike.

Please find attached a short technical memo from Azimuth providing their interpretation of the current turbidity resulting from this construction.

AEM is taking the following actions:

1. We are completing placement of the rockfill as quickly as possible to close off the NE arm of Second Portage Lake. We believe completion of this rockfill barrier is our best protection against future release of turbidity from dike construction into the lake. Based on Azimuth's interpretation it would appear that our current construction activity is not significantly adding to the plumes of turbid water in the lake. These plumes appear to have come under the turbidity barrier from the construction in the deeper water portion of the dike. Construction is now well beyond this zone;
2. We are working with our in house lab at the LaRonde Mine in Abitibi and with chemical suppliers of coagulants and flocculants to assess whether we can enhance the settling of the fine clay particulate both within our construction zone and within the plumes. We are limiting this testing to lab work and will not field apply any coagulant or flocculant without consulting with Environment Canada. We did consult with Environment Canada on August 14th on the use of coagulants and flocculants in natural lake systems to find out what other experience exists in the North. Environment Canada were helpful in this regard but cautioned that use of coagulants or flocculants should be a last resort measure; and
3. Azimuth is continuing to monitor the turbidity situation on our behalf as indicated in the attached technical note.

Regards

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From: Larry Connell

Sent: Friday, August 22, 2008 11:27 AM

To: Wilson,Anne [Yel]

Cc: Liu, Amy; Louise Grondin; Ryan Vanengen; Rachel Gould; Gary Mann; Stéphane Robert; Denis Gourde; Martin Bergeron

Subject: Meadowbank East Dike Construction Use of Coagulants and Flocculants

Anne:

We are trying to ensure that we pursue every option in addressing our turbidity problems associated with construction of the East Dewatering Dike. We have been testing coagulants and flocculants in the lab to determine an optimized mix that can enhance the settling rate of the sediment within the water column. We have had success with a mix of Alum, Magnafloc 10 and Sodium Silicate. The relative concentrations within the water column for these settling agents are 200 ppm Alum, 2 ppm Magnafloc 10 and 150 ppm Sodium Silicate. The net impact on water pH is nil (the sodium silicate offsets the Alum). This combination was very effective in the lab in rapidly knocking down the suspended sediment. We did the initial test work at LaRonde using samples of water taken from the Meadowbank site and followed this up by having a flocculant specialist come to site and confirm and optimize the addition rates on fresh samples taken from within the East Dike work zone. We have not yet field tested this mix and need to open further dialogue with Environment Canada on the pros and cons of applying this coagulant/flocculant mix to the East Dike zone because it is will be within a natural lake setting. In the interim we have arranged to have a small supply of these chemicals air freighted to Meadowbank early next week in preparation for a field test pending outcome of our discussions with Environment Canada.

Our quandary is as follows:

- We know that the increased turbidity levels within Second Portage Lake are likely to have some adverse effects but we do not know to what extent and how harmful these impacts will be in the long term. We also expect that with the upcoming end of construction nature will begin to reverse these effects but again we do not know how fast or to what extent;
- If we add Alum as the coagulant we know that we are introducing Al into the lake which has possible negative effects although we do not know to what extent the Al in the Alum is water soluble. We know that Alum is a common water treatment coagulant and thus cannot be a serious concern with respect to human health. However we do not want to solve one problem and potentially create another.

Is there any chance we could open a consultation or dialogue with Environment Canada specialists in this field to help us fully understand the pros and cons of treating the turbid water within the East Dike turbidity barrier with this coagulant flocculant mix. We are looking for some knowledgeable help to make the correct decision. We want to be diligent in taking every possible course of action to resolve our problem but also want to act responsibly and create other problems by rushing

Any chance we could set up a conference call for next Monday or Tuesday to explore the pros and cons?

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From: Ryan Vanengen
Sent: Thursday, August 21, 2008 4:12 PM
To: Larry Connell
Subject: FW: TSS Update - August 21

From: Gary Mann [mailto:GMann@azimuthgroup.ca]
Sent: Thursday, August 21, 2008 6:09 PM
To: Eric M. Lamontagne; Ryan Vanengen; gaston.blanchette@snclavalin.com; Denis Gourde
Cc: Randy Baker; Ryan Hill
Subject: TSS Update - August 21

Gentlemen:

Attached are the most recent results for the routine stations and a time series graph for select stations.

Please let me know if you have any questions,

Gary

Gary Mann, MSc RPBio
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www.azimuthgroup.ca

Richard Dwyer

From: Larry Connell [lconnell@agnico-eagle.com]

Sent: Friday, August 22, 2008 11:40 AM

To: Richard Dwyer; Andrew Keim; <Hartman Stephen; Liu, Amy; Wilson,Anne [Yel]; chad.harden@EC.GC.CA

Cc: Louise Grondin; Ryan Vanengen; Gary Mann; Denis Gourde; Eric M. Lamontagne; Martin Bergeron; Stéphane Robert

Subject: Meadowbank East Dike Construction TSS and Turbidity Issue Update

All:

We are continuing to experience problems with turbidity levels within Second Portage Lake associated with the construction of the East Dike. High winds on Tuesday night appeared to have dissipated the highly turbid water located at depth at SE3 and NE1. Follow-up sampling found these zones reforming later in the afternoon (and again Thursday morning).

A distinct plume was visible on the upstream side in association with the southern section of the SE turbidity barrier. While the really high turbidity values associated with the deep zone were not encountered on Thursday, both SE2 and SE3 had higher values in the upper water column than normally encountered. At first we thought that this might be due to mixing of the deep turbid water into the upper water column. However, that would unlikely result in the clear plume line that was observed. Rather, the plume is more likely due to activities in the work zone or to water moving through the work zone. This is supported by paired sampling conducted inside/outside the curtain near SE2 (units NTU, not mg/L):

Depth	Inside(4.8m)	Outside(4.5m)
0m	251	234
1m	255	242
2m	255	263
3m	249	263
4m	259	331

These results (which are approximately 60 mg/L TSS and exceed the 24-hr trigger) show little containment within the barrier. Despite implementing some mitigative measures, the East Dike work area continues to be a source of sediment to Second Portage Lake (SPL). TSS levels in SPL have exceeded NWB A License levels at at least one station since Aug 9 and continue to deteriorate (now virtually all stations fail the 7-day TSS trigger). We have subsequently completed the rockfill component of the East Dike from the south at Portage Island to the north shore thus now closing off the impoundment arm of Second Portage Lake from the remainder of the lake.

AEM continues to take all reasonably possible actions to address this sediment issue. We are currently implementing the following actions to address this situation:

- We are installing a low permeability plastic membrane barrier along the upstream face of the East Dike inside the turbidity barrier to enhance the prevention of sediment being able to leave the dike rockfill during cutoff trench excavation.
- We are completing the West Channel Dike to prevent the circulation of water from Third Portage Lake into the impoundment arm of Second Portage Lake to reduce and ultimately eliminate the flow of water from the impoundment arm through the East Dike construction zone into the remainder of Second Portage Lake. We anticipate having this flow cut off within the next 48 hours.
- We are scouring for additional turbidity barrier to install additional cutoff barriers on the upstream side of the East Dike.
- We have been testing coagulants and flocculants in the lab to determine an optimized

mix that can enhance the settling rate of the sediment within the water column. We have had success in a mix of Alum, Magnafloc 10 and Sodium Silicate. The relative concentrations within the water column for these settling agents are 200 ppm Alum, 2 ppm Magnafloc 10 and 150 ppm Sodium Silicate. The net impact on water pH is nil. This combination was very effective in the lab in rapidly knocking down the suspended sediment. We did the initial test work at LaRonde using samples of water taken from the Meadowbank site and followed this up by having a flocculant specialist come to site and confirm and optimize the addition rates on fresh samples taken from within the East Dike work zone. We have yet field tested this mix and need to open further dialogue with Environment Canada on the pros and cons of applying this coagulant/flocculant mix to the East Dike zone because it is will be within a natural lake setting. We have arranged to have a small supply of these chemicals air freighted to Meadowbank early next week in preparation for a field test pending outcome of our discussions with Environment Canada.

We have asked Azimuth to develop a further monitoring program to assess the potential impact and consequence of these sediment releases into Second Portage Lake to help answer the question: What has the impact been on the Second Portage Lake ecosystem? We will provide further updates as this situation evolves.

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From: Ryan Vanengen
Sent: Thursday, August 21, 2008 4:12 PM
To: Larry Connell
Subject: FW: TSS Update - August 21

From: Gary Mann [mailto:GMann@azimuthgroup.ca]
Sent: Thursday, August 21, 2008 6:09 PM
To: Eric M. Lamontagne; Ryan Vanengen; gaston.blanchette@snclavalin.com; Denis Gourde
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Subject: TSS Update - August 21

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From: Larry Connell
Sent: Thursday, September 04, 2008 6:41 AM
To: 'Richard Dwyer'; 'Wilson,Anne [Yel]'; 'Liu, Amy'; 'Kevin Buck'; '<Yeh Helen'; '<Hartman Stephen'
Cc: 'Andrew Keim'; 'chad.harden@ec.gc.ca'; Louise Grondin; 'Gary Mann'; Eric M. Lamontagne; Denis Gourde; Rachel Gould; 'Ryan Hill'; 'Blanchette, Gaston'
Subject: RE: 2AM-MEA0815-Meadowbank - Application to Test Chitosan Flocculant at Meadowbank
Attachments: Azimuth Technical Memo - Chitosan.doc

All:

Further to my email of yesterday, please find attached a technical memorandum prepared for AEM by Azimuth Consulting providing an overview of Chitosan Lactate and its potential use at Meadowbank including a summary of available data on aquatic toxicity.

Regards

Larry Connell, P.Eng.
Regional Manager: Environment, Social and Government Affairs

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From: Larry Connell
Sent: Wednesday, September 03, 2008 9:51 AM
To: Richard Dwyer; Wilson,Anne [Yel]; Liu, Amy; Kevin Buck; <Yeh Helen; <Hartman Stephen
Cc: Andrew Keim; chad.harden@ec.gc.ca; Louise Grondin; Gary Mann; Eric M. Lamontagne; Denis Gourde; Rachel Gould; Ryan Hill; Blanchette, Gaston
Subject: 2AM-MEA0815-Meadowbank - Application to Test Chitosan Flocculant at Meadowbank

All:

Given the sensitivity of using synthetic polymeric flocculants, AEM has discontinued this line of research and have re-focused our efforts on finding natural means of reducing turbidity within the portion of Second Portage Lake to be dewatered. With assistance from our consultants we have identified a natural water treatment agent known as ChitoVan Chitosan Lactate that has been used in BC with DFO consent to treat turbidity levels in fish bearing waters. We are working with a Vancouver group called KI Environmental Solutions Inc. in Vancouver to test how Chitosan would work at the East Dike at Meadowbank. This agent is a combination of Chitosan and lactic acid (glucosamine base). I have attached literature on Chitosan and its known toxicity in the aquatic environment for your review.

We would like to test 100 lbs of Chitosan to treat approximately 80,000 cubic meters of turbid water inside the turbidity barrier between the barrier and the East Dike on the upstream side of the dike (inside the portion of the lake to be dewatered). Our plan would be to arrange for two technicians from KI Environmental come to Meadowbank next week to run this test. They would start by running a series of bench scale tests to determine site-specific application rate. The rate will then be compared relative to the available toxicity information. A brief plan will then be drafted to support application of Chitosan within the work area and for discussion with the regulators. The attached "ChitoVan lactate toxicity report" provides guidance on application rates to achieve a 3-fold safety factor below the most sensitive endpoints tested. The proposed application method has been previously used by KI in treating several acre sized ponds with success. In short, the Chitosan is housed in canisters within a geomembrane. They would be towed behind a boat and essentially dissolve, with the outboard turbulence facilitating mixing. The upper 1.5 meters would be targeted, with the expectation that the induced sedimentation would essentially keep working as it settled through the deeper portions of the water column. Two or three boats would likely suffice. KI will bring an analysis kit to measure Chitosan concentrations on site; they will have enough reagent to do 100 samples. The kit's detection limit is 0.2 mg/L, which is well under the likely target application rate and the toxicity thresholds. Sampling will be conducted on our behalf by Azimuth Consulting both inside the turbidity barrier zone (i.e., to verify that Chitosan concentrations do not exceed the toxicity thresholds) and in the lake near the turbidity barriers (i.e., to ensure limited to no escapement of Chitosan). The results of the work zone (i.e., inside turbidity barrier) testing will be used as a basis for evaluating whether Chitosan should be considered any further for application in the receiving environment or for application to control turbidity during future in-water construction works.

Through this email we are applying for authorization from the Water Board to allow this test to proceed.

Regards

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From: Larry Connell
Sent: Thursday, September 11, 2008 9:21 AM
To: 'Richard Dwyer'; 'Andrew Keim'; '<Hartman Stephen'; 'Liu, Amy'; 'Wilson,Anne [Yel]'; 'chad.harden@ec.gc.ca'; Cooper, Gary
Cc: Louise Grondin; Ryan Vanengen; 'Gary Mann'; Denis Gourde; Eric M. Lamontagne; Martin Bergeron; Stéphane Robert; Sylvain Doire; Randy Baker
Subject: Meadowbank East Dike Construction TSS and Turbidity Issue Update

All:

This is intended to provide an update to East Dike construction status at the Meadowbank site. The following provides a quick timeline summary for the East and West Channel Dikes:

- August 17th – The east dike embankment rockfill is completed from south to north closing off the northeast arm of Second Portage Lake with a pervious rockfill structure;
- August 23rd – Excavation and lakebed sediment removal from the East Dike core trench is completed;
- August 26th – Placement of crushed screened rockfill filter into the East Dike core trench is completed
- August 30th – Backfill of crushed and sized rockfill into the East Dike core trench is completed – compaction of the core trench under way
- September 07th – Compaction of backfilled East Dike core trench completed
- September 07th – Excavation and installation of East Dike cement bentonite cutoff wall started and is ongoing as of September 11th
- September 08th – Construction of West Channel Dike till core is started and was about 40% complete by September 10th

TSS (measured as turbidity) levels within Second Portage Lake have been decreasing since approximately August 26th. All of the west monitoring stations are indicating TSS levels of 6 mg/L or less. All NE and SE stations are now below the 15 mg/L TSS threshold. We still have some high value habitat monitoring stations showing TSS levels above 6 mg/L but these are also trending downwards.

Since my last update AEM has undertaken a number of activities to reduce and mitigate the introduction of total suspended solids into Second Portage Lake from the East Dike construction zone. The following summarizes these activities:

- An additional 260 meters of turbidity curtain was installed along the outside (lake side) of the East Dike in the area where trenching and placement of cutoff wall material was underway;
- Tarps and available HDPE liner material on site were used to place a plastic “cap” or barrier along the outside slope (lake side) of the East Dike rockfill to reduce the release of sediment from flowing passing through the Dike fill.
- A temporary dike was installed at the Western channel crossing to stop all flow

(except some subterranean flow) from Third Portage Lake into Second Portage Lake through the west channel. The flow was cut off by August 24th. This in turn reduced the amount of water flowing through the East Dike construction zone as it reduced the flow into the upstream northeast arm of Second Portage Lake to surface runoff only;

- An additional 900 meters of turbidity barrier was ordered from the US supplier on an emergency basis for deployment as necessary;
- An order was placed for 400 meters of tarpaulins on an emergency basis to provide a source of material for further deployment if necessary.

Measured TSS levels within the turbidity barriers have significantly decreased since mid August and are now at levels of approximately 30 mg/L well below the 230 to 250 mg/L levels experienced earlier in August.

A team of two technicians from KI Environmental arrived at Meadowbank on Tuesday September 09th with their testing equipment and 100 – 1 Kg socks of Chitosan flocculant. They started bench testing on Wednesday and should be ready to field test Chitosan by September 12th. Field testing will be restricted to the impoundment side of the East Dike to the water inside the turbidity barrier to ensure that settled sediments remain inside the dewatered impoundment area. I will report the results of the bench testing to all ASAP.

Azimuth has completed a proposed field program to assess the effects of the high TSS levels in Second Portage Lake. This program proposal will be forwarded to all under separate cover either later today or tomorrow. The intention is to start this work before ice forms on the lake this Fall with a follow up program next year.

I have attached the most recent updates on TSS sampling within Second Portage Lake updated through September 10th

In summary the actions taken have reduced TSS release from the ongoing construction and we are seeing TSS levels trend downwards within Second Portage Lake.

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From: Larry Connell

Sent: Friday, September 12, 2008 9:11 AM

To: 'Richard Dwyer'; 'Andrew Keim'; '<Hartman Stephen'; 'Liu, Amy'; 'Wilson,Anne [Yel]'; 'chad.harden@ec.gc.ca'; 'Cooper, Gary'; Luis Manzo

Cc: Louise Grondin; Ryan Vanengen; 'Gary Mann'; Denis Gourde; Eric M. Lamontagne; Martin Bergeron; Stéphane Robert; Sylvain Doire; 'Randy Baker'; Rachel Gould

Subject: Meadowbank East Dike Construction TSS and Turbidity Issue Update - Effects Monitoring Strategy

Attachments: TSS Effects Monitoring Strategy Technical Memorandum v2.pdf

All:

As referenced in my email of September 11th AEM commissioned Azimuth Consulting to develop a strategy and monitoring program to assess the effects of the increased turbidity within Second Portage Lake resulting from construction of the East Dike this past summer. The objective is to initiate additional sampling and testing to complement the existing annual aquatics effect monitoring to assess what measurable effects these increased turbidity levels may have had on the water quality and aquatic ecosystem within Second Portage Lake. Please find attached a copy of a technical memorandum from Azimuth Consulting entitled “Effects Assessment Strategy for Elevated TSS in Second Portage Lake” for your review. AEM has given the green light for the implementation of this monitoring and testing to Azimuth so that the first rounds of data and sample collection can be completed before ice over this fall. Additional follow up rounds will be required once the ice cover comes off in 2009.

We felt that it was critical to move forward so that this fall period is not missed for data collection. We still welcome all input and comment. We can adjust the program moving forward to reflect this input. Our concern was that if we wait for formal review we will have missed the opportunity to start collecting data and samples before the ice forms this fall.

Regards

Larry Connell, P.Eng.
Regional Manager: Environment, Social and Government Affairs

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From: Larry Connell

Sent: Friday, September 12, 2008 2:36 PM

To: 'Richard Dwyer'; 'Andrew Keim'; '<Hartman Stephen'; 'Liu, Amy'; 'Wilson,Anne [Yel]'; 'chad.harden@ec.gc.ca'; 'Cooper, Gary'; Luis Manzo

Cc: Louise Grondin; Ryan Vanengen; 'Gary Mann'; Denis Gourde; Eric M. Lamontagne; Martin Bergeron; Stéphane Robert; Rachel Gould

Subject: Meadowbank East Dike Construction - Chitosan Bench Test results & Field Test Plans

All:

As indicated in my earlier email of this week we have had two technicians from KI Environmental on site bench testing the use of Chitosan to flocculate suspended solids from the water column within the stretch of water between the East Dike and the turbidity barrier on the impoundment side of the dike. The bench test results were conducted on two samples:

- The standing water within this area; and
- A sample of water taken within this area after the settled solids had been stirred up back into suspension

I have attached a copy of the first report on this testing from KI Environmental. The results from the bench scale test are quite encouraging with significant removal of TSS within 24 hours of settling time. Based on these results it is our intent to proceed to a field test within this same area of water starting next Monday. Note that it may take about 1.5 to 2 days to make the application. Our strategy for monitoring turbidity and measuring residual Chitosan lactate in the water column is as follows:

Turbidity: Conduct turbidity monitoring, surface to bottom at 4 stations (opposite to our routine stations, but inside the silt curtain) prior to application, after 4 hours (end of day), beginning of day 2 and end of application at day 2. We will conduct a further round of sampling 1 day after application (day 3 morning and afternoon). This is in addition to routine monitoring outside of the silt curtain.

Chitosan Lactate: KI will monitor Chitosan lactate concentrations at the same 4 locations at surface and from within 1 m of bottom at twice per day. If the application takes 2 days, we will have 4 stations x 2 depths x 4 time periods = 32 measurements. We will do a third round of monitoring, consistent with turbidity profiling on day 3, one day after application.

We'll keep track of wind speed and direction...and hope for calm weather.

Regards,

Larry Connell, P.Eng.
Regional Manager: Environment, Social and Government Affairs

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From: Larry Connell
Sent: Friday, August 22, 2008 10:40 AM
To: Richard Dwyer; Andrew Keim; <Hartman Stephen; Liu, Amy; Wilson,Anne [Yel]; chad.harden@ec.gc.ca
Cc: Louise Grondin; Ryan Vanengen; Gary Mann; Denis Gourde; Eric M. Lamontagne; Martin Bergeron; Stéphane Robert
Subject: Meadowbank East Dike Construction TSS and Turbidity Issue Update

All:

We are continuing to experience problems with turbidity levels within Second Portage Lake associated with the construction of the East Dike. High winds on Tuesday night appeared to have dissipated the highly turbid water located at depth at SE3 and NE1. Follow-up sampling found these zones reforming later in the afternoon (and again Thursday morning).

A distinct plume was visible on the upstream side in association with the southern section of the SE turbidity barrier. While the really high turbidity values associated with the deep zone were not encountered on Thursday, both SE2 and SE3 had higher values in the upper water column than normally encountered. At first we thought that this might be due to mixing of the deep turbid water into the upper water column. However, that would unlikely result in the clear plume line that was observed. Rather, the plume is more likely due to activities in the work zone or to water moving through the work zone. This is supported by paired sampling conducted inside/outside the curtain near SE2 (units NTU, not mg/L):

Depth	Inside(4.8m)	Outside(4.5m)
0m	251	234
1m	255	242
2m	255	263
3m	249	263
4m	259	331

These results (which are approximately 60 mg/L TSS and exceed the 24-hr trigger) show little containment within the barrier. Despite implementing some mitigative measures, the East Dike work area continues to be a source of sediment to Second Portage Lake (SPL). TSS levels in SPL have exceeded NWB A License levels at at least one station since Aug 9 and continue to deteriorate (now virtually all stations fail the 7-day TSS trigger). We have subsequently completed the rockfill component of the East Dike from the south at Portage Island to the north shore thus now closing off the impoundment arm of Second Portage Lake from the remainder of the lake.

AEM continues to take all reasonably possible actions to address this sediment issue. We are currently implementing the following actions to address this situation:

- We are installing a low permeability plastic membrane barrier along the upstream face of the East Dike inside the turbidity barrier to enhance the prevention of sediment being able to leave the dike rockfill during cutoff trench excavation.
- We are completing the West Channel Dike to prevent the circulation of water from Third Portage Lake into the impoundment arm of Second Portage Lake to reduce and ultimately eliminate the flow of water from the impoundment arm through the East Dike construction zone into the remainder of Second Portage Lake. We anticipate having this flow cut off within the next 48 hours.
- We are scouring for additional turbidity barrier to install additional cutoff barriers on the upstream side of the East Dike.
- We have been testing coagulants and flocculants in the lab to determine an optimized mix that can enhance the settling rate of the sediment within the water column. We have had success in a mix of Alum, Magnafloc 10 and Sodium Silicate. The relative concentrations within the water column for these settling agents are 200 ppm Alum, 2

ppm Magnafloc 10 and 150 ppm Sodium Silicate. The net impact on water pH is nil. This combination was very effective in the lab in rapidly knocking down the suspended sediment. We did the initial test work at LaRonde using samples of water taken from the Meadowbank site and followed this up by having a flocculant specialist come to site and confirm and optimize the addition rates on fresh samples taken from within the East Dike work zone. We have yet field tested this mix and need to open further dialogue with Environment Canada on the pros and cons of applying this coagulant/flocculant mix to the East Dike zone because it is will be within a natural lake setting. We have arranged to have a small supply of these chemicals air freighted to Meadowbank early next week in preparation for a field test pending outcome of our discussions with Environment Canada.

We have asked Azimuth to develop a further monitoring program to assess the potential impact and consequence of these sediment releases into Second Portage Lake to help answer the question: What has the impact been on the Second Portage Lake ecosystem? We will provide further updates as this situation evolves.

Larry Connell, P.Eng.
Regional Manager: Environment, Social and Government Affairs

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From: Ryan Vanengen
Sent: Thursday, August 21, 2008 4:12 PM
To: Larry Connell
Subject: FW: TSS Update - August 21

From: Gary Mann [mailto:GMann@azimuthgroup.ca]
Sent: Thursday, August 21, 2008 6:09 PM
To: Eric M. Lamontagne; Ryan Vanengen; gaston.blanchette@snclavalin.com; Denis Gourde
Cc: Randy Baker; Ryan Hill
Subject: TSS Update - August 21

Gentlemen:

Attached are the most recent results for the routine stations and a time series graph for select stations.

Please let me know if you have any questions,

Gary

Gary Mann, MSc RPBio
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Meadowbank Gold Mine Second Portage Lake ChitoVan LC™ Field Application and Monitoring

Meadowbank Gold Mine,

Nunavut

Prepared for:

Agnico Eagle Mines Limited & Azimuth Consulting Group Inc

By:

KI environmental services inc.

#170 – 6751 Graybar Road,
Richmond, BC

October 3, 2008

TABLE OF CONTENTS

TABLE OF CONTENTS 1

1 INTRODUCTION 3

2 GOALS AND SCOPE 3
- 2.1 Site Location 3
- 2.2 Site Access 3
- 2.3 Site Description 3

3 MATERIALS AND METHODS 4
- 3.1 Preparations 4
- 3.2 Field Applications 4
- 3.3 Test Equipment 6
- 3.4 Water Monitoring and Sampling 6

4 RESULTS AND DISCUSSION 7
- 4.1 Weather 7
- 4.2 pH and Turbidity 8
- 4.3 Background Monitoring 9
- 4.4 Residual Chitosan Test 9

5 CONCLUSIONS 10

Appendices 12
- Appendix A – Meadowbank Gold Mine Treatability Study Using ChitoVan LC™ 1
- Appendix B – Cascade EcoSolutions Inc. ChitoVan LC™ Best Management Practices 101 1
- Appendix C – An Introduction to Chitosan Enhanced Sand Filtration 1

LIST OF FIGURES

Figure 3.2-1 – West Second Portage Lake....1
Figure 3.2-2 – Chitosan Treatment on Second Portage Lake....3
Figure 4.2-1 – Water Column Turbidities Average for Each Sample Site 33
Figure 4.2-2 – Turbidity Summary 36
Figure 4.4-1 – Residual Chitosan – Sample Set .40 trt-01 45

LIST OF TABLES

Table 3.3-1 – Test Equipment....35
Table 3.4-1 – Sampling Coordinates 42
Table 3.4-2 – Sample Sets....42
Table 4.1-1 – Weather Data 42

1 INTRODUCTION

The Azimuth Consulting Group Inc. (Azimuth), an environmental subcontractor for Agnico Eagle Mines Limited (Agnico), contacted KI Environmental (KI) on September 4th, 2008 with regard to chitosan treatment on Second Portage Lake. All parties agreed that a treatability study should be performed prior to considering a full-scale system.

This study consisted of a preliminary bench-scale test (Appendix 1); followed by a field study conducted within a section of Second Portage Lake. The treated section is located between a turbidity curtain and the newly constructed East Dike. The Meadowbank Gold Mine Lake Water Treatability Study Using ChitoVan LC™ report (Appendix 1) was submitted to Fisheries and Oceans Canada (DFO) on September 12, 2008 for review prior to field application. Following authorization, ChitoVan LC™ application and monitoring began on the afternoon of September 15, 2008, and continued through September 19, 2008. Field testing was performed as specified in Section 4.2 (page 3) of Appendix 1.

John Mandelin and Mike Yoshizawa of KI Environmental Inc. (KI) performed the field application and monitoring with the assistance of field technicians from Azimuth.

.

2 GOALS AND SCOPE

The goal of the field application was to better understand treatment efficacy under extreme weather conditions over a section of Second Portage Lake. Therefore, the weather conditions were documented in addition to pH, turbidity and residual chitosan measurements.

2.1 Site Location

The mine is located in the Kivalliq district of Nunavut and lies in the Third Portage Lake area, approximately 70 km north of the Hamlet of Baker Lake, near the western shore of Hudson's Bay.

2.2 Site Access

A 110 km all-season road provides access from Baker Lake, NU to the mine site.

2.3 Site Description

The Meadowbank comprises a series of Archean-aged gold deposits hosted within polydeformed rocks of the Woodburn Lake Group; part of the series of Archean

Supracrustal assemblages forming the Western Churchill supergroup in northern Canada.

Currently, three of the four deposits are planned to be mined. The Goose Island and Portage deposits are hosted by highly deformed magnetite rich iron formation rocks while an intermediate volcanic rock assemblage hosts the majority of the mineralization at the more northerly Vault deposit. In all deposits, gold mineralization is commonly associated with intense quartz flooding, and the presence of iron sulphite minerals (pyrite and/or pyrrhotite).[1]

3 MATERIALS AND METHODS

3.1 Preparations

Three ChitoVan LC™ assemblies were constructed by tying the end of each cartridge to a single rope (Appendix 1, Figure 4.2-1). The first two assemblies deployed consisted of 33 cartridges while the third deployed had 34 cartridges. At the ends of the assembly, approximately 8 feet of rope was left to tie onto the back of each side of the boat.

Prior to field application, the weather parameters were recorded daily via the weather station located within the Meadowbank environmental building. Weather parameters include:

- Temperature
- Wind Speed
- Wind Direction
- General Observations

3.2 Field Applications

The application of 0.40 ppm chitosan lactate occurred on the following dates and times:

- 1st Application on September 15th from 1400 to 1630 – 33 lbs, or 0.15 ppm
- 2nd Application on September 17th from 1350 to 1630 – 67 lbs, or 0.30 ppm

The test equipment and chitosan was placed into an 18' aluminum motor boat. The boat entered the treatment section on the west side of Second Portage Lake between the turbidity curtain and the East Dike (Figure 3.2-1).

1 http://www.agnico-eagle.com/English/GrowthProjects/Projects/Meadowbank/default.aspx

Figure 3.2-1. West Second Portage Lake

Once the cartridge assembly was secured, the boat motor propeller provided the turbulence needed to dissolve the cartridges (Figure 3.2-2). Every half-hour the cartridges were retrieved from the water and the percent of remaining chitosan was estimated using the "squeeze test." Monitoring was performed as detailed in section 4.4.

Figure 3.2-2. Chitosan Treatment on Second Portage Lake

Due to extreme winds (48 km/h gusts); the second field application had to be postponed until the afternoon of September 17th.

3.3 Test Equipment

Turbidity and pH was measured on site with calibrated instruments according to the manufacture's methods (Table 3.3-1). Residual chitosan tests were performed according to Cascade EcoSolutions' SOP (Appendix 1, Residual Chitosan Field Test Instructions) at the Meadowbank environmental building.

Table 3.3-1. Test Equipment

Instrument Model	Parameter	Range	Accuracy
Eutech Instruments pHTestr 10	pH (Standard Units)	-1.0 – 15.0 pH	0.1 pH
Mcvan Instruments Analyte NEP160	Turbidity (NTU)	0 – 30,000 NTU	+/- 1.0 NTU
Cascade EcoSolutions Chitosan Residual Kit	Residual Chitosan (≥ 0.20 ppm via Colorimetric Test)	-	-

3.4 Water Monitoring and Sampling

The pH and turbidity monitoring process involved taking water quality readings before and after each treatment set. PH was recorded at site 1 (Table 3.4-1); and turbidity was measured at the water surface and at each meter throughout the water column at each sample location.

Table 3.4-1. Sampling Coordinates

Site Number	Coordinates
1	14W 0639322, 7213923
2	14W 0639312, 7214020
3	14W 0639312, 7214136
4	14W 0639293, 7214310

Residual chitosan samples were retrieved using clean one-litre sample bottles. The residual was tested within one hour after bottling. One residual chitosan background sample was tested before treatment (Table 3.4-2).

Residual chitosan sampling sets occurred directly after each treatment event. Each sampling set consisted of a total of eight samples –two samples per site. One sample was scooped from the surface and the other was pumped, using a small 12-volt bilge pump, from one meter above the bottom.

Table 3.4-2. Sample Sets

Date	Time	Treatment	Sample Set Identification
9-15-2008	14:33	No treatment	ntrt-01*
9-15-2008	16:48	0.15 ppm treatment, no settling	.15trt-01*
9-17-2008	13:54	0.15 ppm treatment, 2 days of settling	.15trt-02
9-17-2008	16:32	0.40 ppm cumulative treatment, no settling	.40trt-01*
9-18-2008	08:48	0.40 ppm cumulative treatment, 1 day settling	.40trt-02
9-19-2008	07:59	0.40 ppm cumulative treatment, 2 days settling	.40trt-03
*Residual chitosan sampling and testing.			

4 RESULTS AND DISCUSSION

4.1 Weather

The weather data is presented in Table 4.1-1 below. The Environment Canada website[2] for Baker Lake weather history was referred to for the average daily temperature and wind gust information. Throughout the test period the temperature ranged from -4.3 °C to 2.1 °C while the average daily temperature was – 0.9 °C. In general, while testing moderate to strong wind gusts out of the North caused small whitecaps to form in the lake.

Table 4.1-1. Weather Data

Date	Time	Recorded Temp (°C)	Average Daily Temp (°C)	Wind Direction	Max Wind Gusts (km/hr)	Observations
9/15	1400	1.1	-0.9	N	31	Cloudy, windy and snowing.
9/16	0750	-2.2	-1.6	N, NE	48	Overcast, with very high wind gusts and light snow.
9/17	1400	1.0	-0.3	N, NE	39	Periods of wind and light frozen rain.
9/18	0730	-3.0	-1.5	N	<31	Weather nice, lake calm.
9/19	-	-	-0.2	NE	42	Clear sky and very windy.

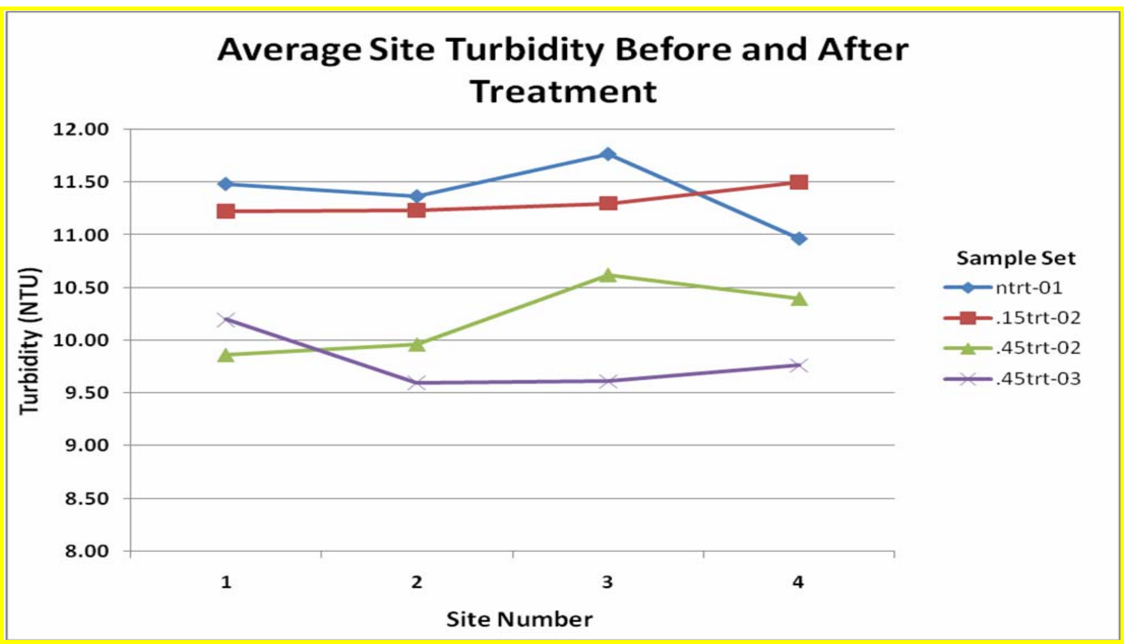
[2] See the Environment Canada website at http://www.climate.weatheroffice.ec.gc.ca for historical weather information.

4.2 pH and Turbidity

Chitosan performs best under neutral pH conditions (6.5 ≤ pH ≤ 8.5). Chitosan is typically effective at relatively low concentrations, thus its slightly acidic nature[3] does not affect the pH of the treated water. During the application process, the pH remained relatively neutral. On September 15th, prior to dissolving any chitosan, the pH was measured to be 7.8 s.u. (standard units). Directly after applying 0.15 ppm chitosan, the pH measured was 7.4 s.u. After applying the remaining chitosan the pH measured 7.9 s.u. As expected, the pH remained within the treatable, or neutral, range throughout testing and was not affected by the addition of chitosan.

The turbidity of individual monitoring sets measured at each site and depth within the curtained area were relatively the same (The standard of deviation of each sample set ranged from 0.13 to 0.36 NTUs.). In other words the suspended solids were evenly distributed throughout the treatment area (Figure 4.2-1).

Figure 4.2-1. Water Column Turbidities Averaged for Each Sampling Site

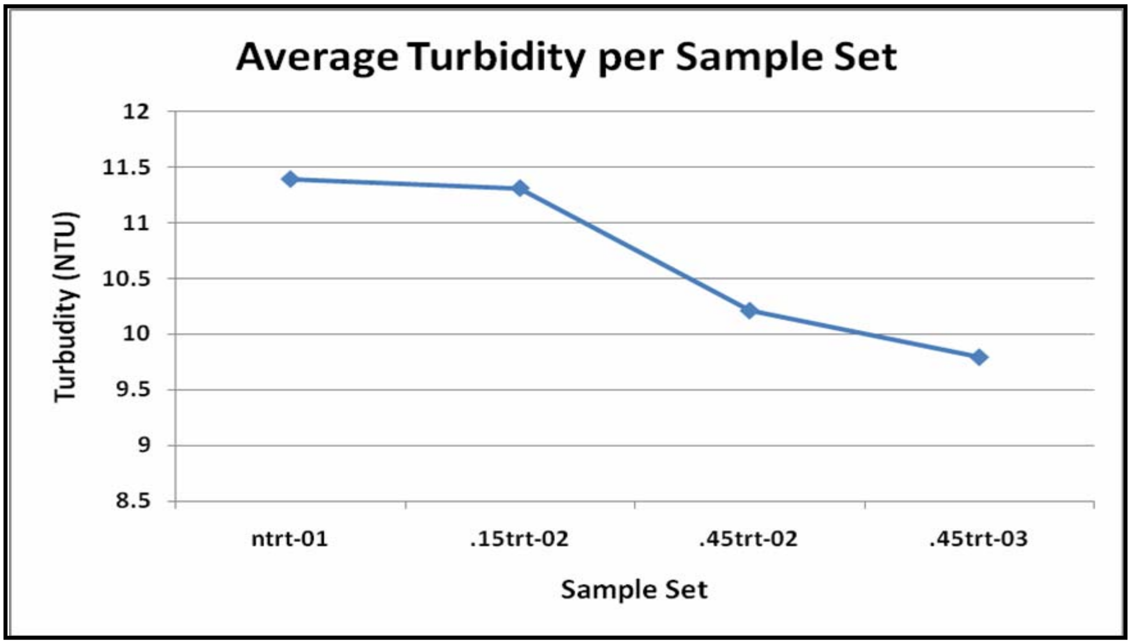


By the time that field application began on September 15th, the majority of suspended solids had already settled to the bottom of the lake. The average turbidity prior to treatment was 11.4 NTU (Figure 4.2-2). Following 0.15 ppm treatment and two days of settling (Sample Set .15trt-02) the turbidity remained unchanged. The turbidity was reduced by 10 percent of the original after treatment with an additional 0.30 ppm

[3] Refer to Appendix 1 ChitoVan LC™ MSDS; a 1% chitosan lactate solution has a pH of 3.7.

chitosan and one day of settling. After two days of settling the turbidity was reduced by a total of 14 percent.

Figure 4.2-2. Turbidity Summary



4.3 Background Monitoring

Azimuth performed routine turbidity monitoring west of the turbidity curtain while treatment occurred. Prior to treatment, the turbidity measured the same as recorded within the treatment area. Instead of recording all values along the water column, Azimuth records the largest turbidity value at each site. The turbidity was 11.8 NTU averaged over four sample locations. On September 19th – after treatment and two days of settling – the average turbidity measured by Azimuth was 11.3 NTU. Comparing the largest values recorded within the treatment area and averaging between all four sample locations the turbidity was reduced by a total of 11 percent.

4.4 Residual Chitosan Test

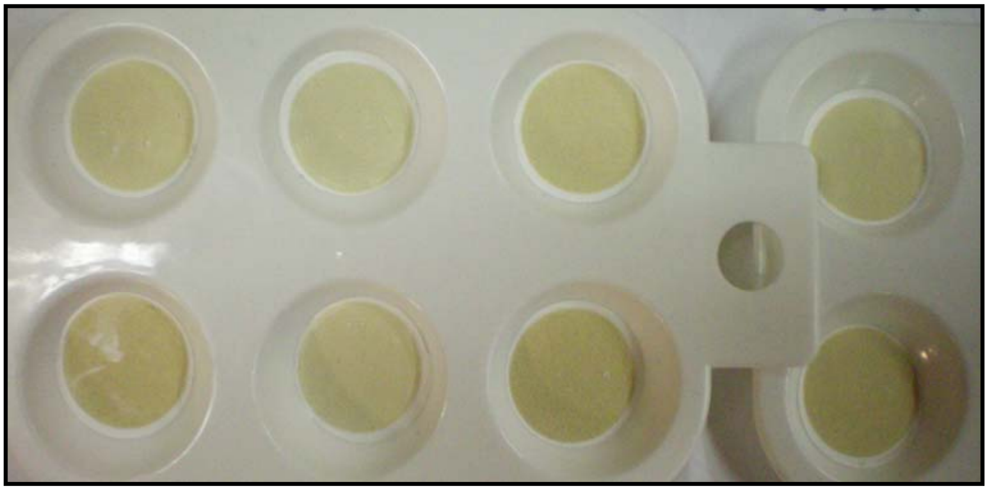
Background and post treatment samples all tested negative for chitosan. Even immediately after the application of 67 lbs of chitosan all samples at the surface and one meter from the bottom indicated < 0.2 ppm chitosan (Figure 4.4-1). These results indicate that less chitosan was present in the water than dissolved.

Figure 4.4-1. Residual Chitosan – Sample Set .40trt-01

Site 1 *Site 2* *Site 3* *Site 4*

1m From Lake Bottom

Lake Surface



5 CONCLUSIONS

Treatment with ChitoVan LC™ via cartridge towing reduced the turbidity by 14 percent. Results in the lab indicated that treatment would reduce the turbidity by more than 60 percent (Appendix 1); however, it is evident that a lower than expected chitosan concentration was present in the treated water. A total of 100 lbs of chitosan was used to treat 120,000 m^3 of water, so the dosage should be 0.40 mg/l. However, residual chitosan tests performed directly after complete application were negative (< 0.20 mg/l).

This can be explained by the rapid rate of treatment. Most cartridges dissolved in less than an hour due to the significant turbulence provided by the boat propeller and boat speed. Cascade EcoSolutions Inc. (Cascade) cartridges were designed to be dissolved over a four to eight hour period. Lab tests at Cascade confirm that forcing more chitosan out of the cartridge results in a more dense gel that has a tendency to sink to the bottom. Once on the bottom the chitosan would attach to sediment already on the bottom of the lake.

This method of treating water with ChitoVan LC™ was a first. Perhaps additional testing could be performed under more controlled conditions. Cascade has prepared a number of ChitoVan LC™ Best Management Practices (BMPs) explaining recommended treatment approaches (Appendix 2). BMP CA 101 would be most appropriate for this job since it could easily be incorporated into the lake pumping operation.

Low water temperatures are also a factor that can affect treatability when using chitosan salts. Prior field experience has shown that as the water temperature approaches 5 °C or less, the coagulated sediment is more buoyant and can take longer to settle. Therefore system design should account for this effect.

Pre-treatment followed with site specific filtration mechanism designed handle buoyant coagulated sediment would be desirable. Filtration options that work well with chitosan include Gabion baskets and/or pressurized sand filtration (Appendix 3).

Appendices

Appendix A – Meadowbank Gold Mine Treatability Study Using ChitoVan LC™

Appendix B – Cascade EcoSolutions Inc. ChitoVan LC™ Best Management Practices 101

Appendix C – An Introduction to Chitosan Enhanced Sand Filtration

Meadowbank Gold Mine Lake Water Treatability Study Using ChitoVan LC™

Prepared for Agnico Eagle Mines Ltd.

Prepared by KI Environmental

September 12, 2008

Table of Contents

1 Introduction 2

2 Chemistry of ChitoVan LC™ 2

3 Purpose 2

4 Materials and Methods 3

4.1 Bench-Scale 3

4.2 Field Application 4

5 Results and Discussion 5

5.1 Bench Scale 5

6 Conclusions 5

6.1 Bench-Scale 5

ATTACHMENT 1: Residual Chitosan Field Test Instructions

ATTACHMENT 2: ChitoVan Lactate Aquatic Toxicity Data

1 Introduction

Agnico Eagle Mines Ltd. (AEM) contacted KI Environmental (KI) on September 4, 2008 to discuss performing a treatability study on the Portage Lake water at the Meadowbank Gold Mine. It was agreed that two field technicians would arrive with test equipment and a 100 lbs (45.4 kg) of ChitoVan LC™ which would be used to treat a small section of the lake that had become turbid.

Mike Yoshizawa and John Mandelin of KI arrived to the Meadowbank Gold Mine job site on September 9, 2008 with all the chemistry and equipment. Bench scale testing was performed on September 10, 2008 to determine treatability efficacy. This report summarizes the findings of the treatability test results. It also describes the field test water monitoring procedure and the protocol that will be implemented to dissolve the cartridges.

2 Chemistry of ChitoVan LC™

Chitosan is derived from chitin and is nature's second most abundant natural biopolymer next to cellulose. Chitin is the structural material found in crustacean shells such as shrimp, crabs, and lobsters. Chitin is also found in fungi cell walls and the exoskeletons of insects. Chitin and chitosan are natural components of biochemical degradation processes occurring naturally in the earth's soil and water. Like chitin, chitosan exists naturally in the environment (water and soil) because it is a biodegradation product of chitin.

Chitosan has been used in storm water treatment for several years. It has the unique ability to adsorb dissolved oil and grease from water, chelate (bond with) heavy metals, and flocculate (precipitate) suspended sediment. Chitosan-based water treatment has also been utilized for decades in various industrial, municipal, swimming pool, spa, and commercial aquarium clarification applications. The U.S. Environmental Protection Agency has approved chitosan for use in drinking water treatment and in the agriculture industry.

Water treatment with Chitosan, at proper dose rates, is highly effective in reducing turbidity levels by up to 99%. Chitosan's efficacy lies in its ability to make small suspended soil particles stick together to become larger and denser. The larger and denser floc particles are easily removed through settling. The cationic (positive charge) nature of chitosan molecules interact with the predominately, anionic (negative charge) sediment particles in water. As these opposite charges attract, the chitosan molecules can bind with numerous soil particles. One must avoid over dosing, which can cause the opposite of the intended effect. An excess of cationic material can cause the floc that initially formed at a lower dose to break apart.

3 Purpose

The goal of this study is to demonstrate the efficacy of ChitoVan LC™ water treatment at the Portage Lake. This will be accomplished through bench and field testing that explores:

- **Turbidity/pH**
- **Dose Rate**

- **Turbidity Reduction**
- **Residual Chitosan**

4 Materials and Methods

4.1 *Bench-Scale*

At 0900 on September 10, two samples were bottled at the shore of the lake. Sample no.1 was clean while sample no.2 was made turbid by swirling the settled solids within the sample area. The turbidity and pH of each sample was measured prior to treatment.

At 1600, one liter each of sample no.1 was poured into two beakers. One liter was left untreated and the other was treated with 0.5 mg/l. They were allowed to settle overnight and the turbidities and chitosan residuals (See Attachment 1 and 2) of each were measured the following day after settling for 20 hours (Figures 4.1-1, 4.1-2).

Figure 4.1-1. Comparing no Treatment vs. 0.5 ppm Chitosan After Settling 20 hrs

Figure 4.1-2. Residual Chitosan Test Kit

Sample no.2 was divided into 2L in two jars for treatability testing and comparisons. One jar was not treated and was used as a control. The water within the other jar was treated with an aqueous 1 % ChitoVan Lactate in 0.5 ppm increments. After each addition of polymer, the water was stirred somewhat vigorously for one minute and allowed to settle for five minutes. Visible sediment settling indicates that chitosan has coagulated the particles.

In general, the beaker may contain clear water on top, or be slightly cloudy, and there should be variation in coagulation amount between dose rates. The object of this test is not to produce completely clean, clear water in the beaker. Rather, it is to determine the most suitable dose rate.

For planning purposes, the smallest effective dosage is used as the initial dose rate.

If there is no coagulation after a significant dosage – greater than 5 ppm – there may be treatability issues. This is rare, and may occur for different reasons which need to be investigated.

The jars were settled overnight and the following day the turbidity was measured after 20 hours of settling. Since the sample turbidity was greater than 10 NTU the chitosan residual was not measured because it clogs the filter paper.

4.2 *Field Application*

The field portion of testing is scheduled to begin on the afternoon of September 12, 2008. Thirty-three ChitoVan LC™ will be tied to a drag line in parallel which will be pulled through the channel of the lake (Between the East Dike and turbidity curtain) behind a boat until all of the chitosan lactate is dissolved[1].

Figure 4.2-1. ChitoVan Cartridges Prepared for Use

While applying the chitosan and 24 hours after treatment, samples will be bottled for turbidity, pH, temperature and residual chitosan testing on location (See Attachment 1). At regular intervals throughout the application process, sampling will occur at both the surface and less than a foot off the bottom at four identifiable locations spaced evenly within the channel. After 24 hours, samples will also be retrieved from these locations.

Weather could affect the test parameters; so the wind, air temperature, and precipitation will also be recorded at the time of each sampling event.

---

[1] The volume of water to be treated is approximately 120,000 m^3 (34 million gallons). Thus, 100 lbs of ChitoVan added to 120,000 m^3 is approximately 0.40 ppm.

5 Results and Discussion

5.1 Bench Scale

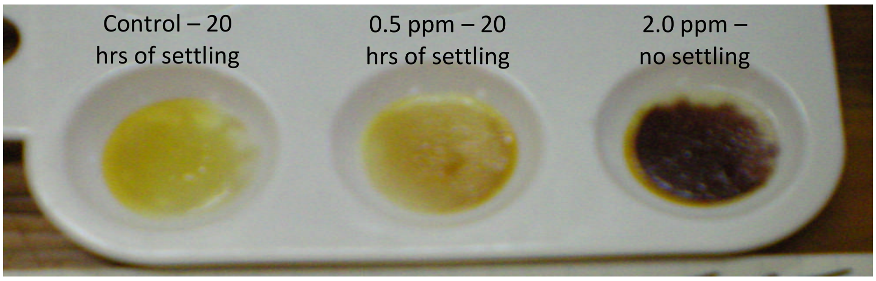
The turbidity and pH of samples no.1 and 2 were recorded prior to the addition of chitosan (Table 5.1-1).

Table 5.1-1. Initial Parameters

Parameter	Sample no.1 Lake Water	Sample no.2 Turbid Lake Water
Turbidity (NTU)	13.70	431
pH	7.3	7.4

In the sample no.1 control beaker the turbidity was reduced from 13.70 to 11.4 NTU through 20 hours of settling (Figure 5.1-1). The 0.50 ppm treated beaker turbidity was reduced by over 60 percent to 4.78 NTU. The residual chitosan test showed that the residual was ~ 0.1 ppm after overnight settling (See Attachment 1). In figure 5.1-1, the 2.0 ppm filter paper was prepared as a "spiked" from tap water for comparison purposes.

Figure 5.1-1. Chitosan Residual Results and Comparison



The final turbidity of the untreated sample no.2 that had settled 20 hrs was reduced from 431 to 131 NTU via gravity settling. The treatability test revealed that 0.5 ppm was required to produce coagulation. To obtain more significant results sample no.2 was dosed with 2.0 ppm. In 20 hours the turbidity was reduced to 12.1 NTU for a total turbidity reduction of 97 percent. The turbidity was reduced by 90 percent in comparison to the untreated and settled sample.

6 Conclusions

6.1 *Bench-Scale*

ChitoVan LC™ as a treatment agent was capable reducing the turbidity of the relatively clean sample no.1 (Lake Water) by more than 60 percent in comparison to the untreated sample (Blank = 11.4 NTU, Treated = 4.78 NTU). Therefore, it is expected that the field test would reduce the turbidity by a similar amount after settling for one day.

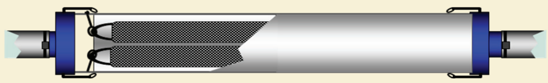
The bench results indicate that if the water did become cloudy again, that passive chitosan treatment would reduce turbidity by over 90 percent.

When used in a more permanent configuration it is recommended that the cartridge be placed either within a conveyance channel or a Camlock hose on the pressure side of the transfer pump. This would allow for more controlled conditions and easy replacement. Also, when chitosan treatment is coupled with passive filtration, further turbidity reduction would occur.

BMP CE 101: Passive Water Treatment Lay-Flat Hose Lactate Dispenser

Cascade EcoSolutions™

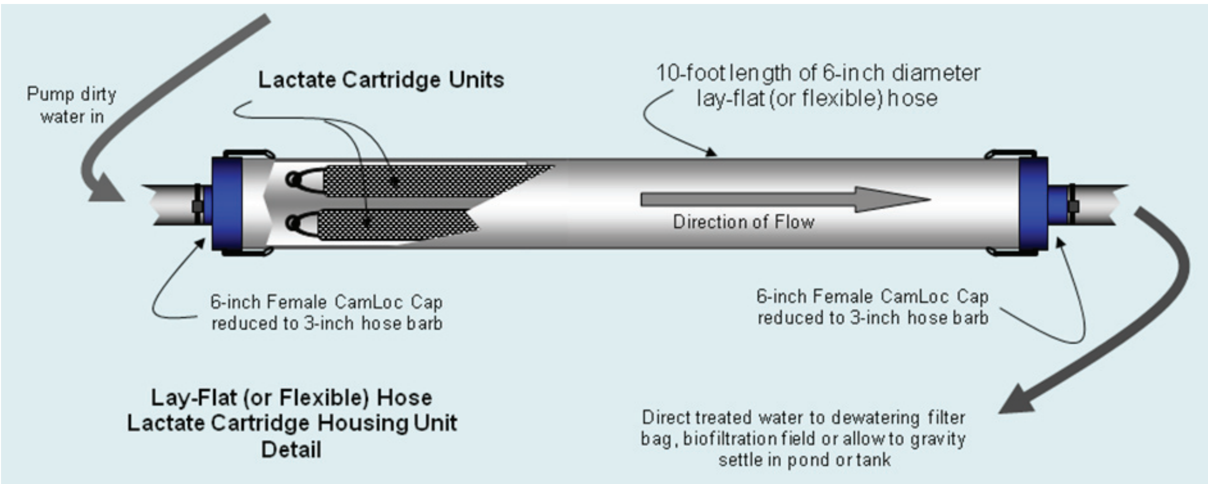
PURPOSE: To protect construction site water quality by treating sediment-contaminated stormwater passively using a *Lay-Flat Hose Dispenser* with chitosan lactate.



Conditions of Use

Traditional BMPs used to control soil erosion and sediment loss from sites under development may not be adequate to ensure compliance with water quality standards for turbidity. Passive water treatment with chitosan lactate will cause the coagulation of fine sediment particles so that the water may subsequently be bio-filtered, bag filtered, sand filtered or gravity settled.

Although chitosan lactate is environmentally safe and worker friendly, a comprehensive plan for use should be developed prior to construction and local and state regulatory personnel should be given access to the plan. In some states regulatory approval may have to be obtained before this BMP can be implemented.

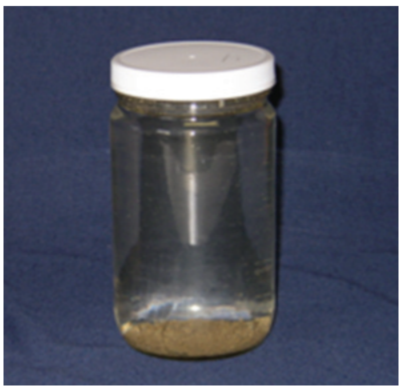


Design and Installation Specifications

Background Information

Traditional BMPs attempt to protect water quality by minimizing sedimentation. With diligent application and maintenance of these sedimentation BMPs and with a properly-sized stormwater detention basin, it is still difficult to meet ever more stringent water quality standards. Many states are revising their construction stormwater NPDES permits to include turbidity thresholds, benchmarks and numeric limits. To meet these new standards something more than sedimentation BMPs is required.

Untreated Stormwater



Stormwater Treated with Chitosan Lactate

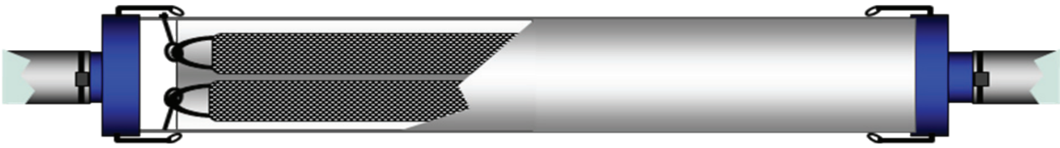
Sediment particles remain suspended in water because of their small size and their static electric charge. Without the static charge the particles would naturally agglomerate and become so dense that they would rapidly settle out leaving clean water. Passive Dosing with Chitosan Lactate accomplishes the critical step of coagulating the very small sediment particles so that they may be settled by gravity or filtered from the water.

BMP CE 101: Passive Water Treatment
Lay-Flat Hose Lactate Dispenser

Cascade EcoSolutions™

Treatment Process Description

1. Unroll the lay-flat passive treatment hose.
2. Install one or two ChitoVan™ Lactate Cartridges in the lay-flat hose (attach the cartridge handle to the anchor bolts installed through the Cam-Loc fittings).



3. Connect the passive treatment assembly above to a pump (limit treatment flow rate to less than 300 gpm for best results).
4. Connect the discharge of the passive treatment assembly to at least 50-feet of hose (to promote proper mixing).
5. The 50-foot hose can be connected to a dewatering filter bag, a settling pond or tank, or it may be connected to a biofiltration dispersal system.

[1] See Cascade EcoSolutions' *Treatment Plan Template.*

Cascade EcoSolutions, Inc.
1916 220th St. SE Bldg. M, Suite 101
Bothell, WA 98021

425.481.0600 *office*
888.481.0326 *toll free*
cascadeeco.com

Revolu+ION®

KI Environmental Services, Inc.'s newly designed Revolu+ION is the state-of-the-art control unit in the stormwater treatment industry. The Revolu+ION is designed to treat sediment-laden stormwater, ground water, and industrial wastewater. It is a mobile unit, which can easily be moved from location to location. The Revolu+ION is the control center for a modular system which allows multiple constituents of concern to be addressed besides turbidity and pH such as metals, hydrocarbons, and pesticides. It is not only a control unit for the treatment system but also acts as an on-site laboratory, monitoring station, and weather station.

The Revolu+ION is equipped to remotely transmit water quality data and to send remote alarm data information to the project manager when site-specific situations arise.

System Safeguards

If water quality characteristics change unexpectedly, the Revolu+ION safeguards will ensure that only treated water, which meets your desired discharge criteria, will be released to your discharge location. On the rare occasion that treated water does not meet the desired parameters, it will be re-circulated and treated again. In addition, the on-site weather station, float system, and the text messaging alarm warning provide a safety network unlike any other in the industry. These safeguards provide you the assurance that the Revolu+ION can keep you in compliance, even in the worst conditions.

Performance

The Revolu+ION control unit has been designed after years of in-field work for optimum performance. It is able to treat influent water of over 1000 NTU to below 10 NTU at 500 gpm.

Quick Facts

- **Modular unit capable of addressing multiple pollutants of concern**
- **System safeguards to disallow discharges above preset parameters**
- **Monitoring of influent and discharge water**
- **Radio telemetric data collection & transmission**
- **Self contained lab and weather station**

KI environmental services inc.
innovations in urban environmentalism

Revolu⁺ION® Model Specification

Your Clear Water Quality Solu⁺ION!™

OVERVIEW

- 500 GPM NOMINAL DISCHARGE CAPACITY (W/ 54-4 SANDFILTER COMPONENT)
- MOBILE CESF CONTROL UNIT WITH QUICK-DISCONNECT PLUMBING AND ELECTRICAL CONNECTIONS
- pH ADJUSTMENT, PRETREATMENT, & ENHANCED MIXING CAPABILITIES
- MANUAL OVERRIDE TOGGLE SWITCHES FOR ALL AUTOMATED DEVICES
- AUTOMATED FEATURES:
    - DISCHARGE/RECIRC CONTROL
    - BACKFLUSH CONTROL
    - AUTOMATED MICRO-PACE CHEMICAL INJECTION ADD-ON READY
    - ALARM ANNUNCIATION & TEXT MESSAGING TRANSMISSION
    - PUMP CONTROLS

TREATMENT CAPACITY

- DISCHARGE/TREATMENT RATE: 350 - 600 GPM
- PRETREATMENT RATE: 500 - 1000 GPM

WATER QUALITY PARAMETERS

- TURBIDITY: PRETREAT & MAINLINE INJECTION PORTS
- pH ADJUSTMENT: PRETREAT INJECTION PORTS
- OTHERS AS NEEDED

SAFETY FEATURES

- FIRE EXTINGUISHER
- BUILT IN EXTERNAL LIGHTING WITH AVAILABLE MOTION-DETECT ADD-ON
- FIRST AID KIT
- EYEWASH STATION
- CPR MASKS
- UNIT IS SECONDARILY CONTAINED FOR LIQUID STORAGE

DATA STORAGE

- AUTOMATED WEB BASED DOWNLOAD CAPACITY
- DATA RETENTION CAPACITY: UP TO 48 HOURS BETWEEN DOWNLOADS IN AN EMERGENCY
- RECORDS DATA ON TIME-WEIGHTED AVERAGES OVER 15 MINUTE INTERVALS

DATA POINTS

- pH: PRETREAT, INFLOW, DISCHARGE
- TURBIDITY: INFLUENT, DISCHARGE
- FLOW: PRETREAT, INFLOW, DISCHARGE
- PRESSURE: PRE-SANDFILTER, POST-SANDFILTER
- ENVIRONMENTAL: RAIN EVENT, TEMPERATURE WITH TEXT MESSAGE ALARM SYSTEM
- TANK LEVELS: FLOAT/LEVEL TRANSDUCER WITH TEXT MESSAGE ALARM SYSTEM
- POND LEVELS: FLOAT/LEVEL TRANSDUCER WITH TEXT MESSAGE ALARM SYSTEM

AUTOMATED FEATURES

- PNEUMATIC DISCHARGE/RECIRCULATION VALVE SELECTION: PLC CONTROLLED BASED ON REAL-TIME DATA AND ADJUSTABLE SET POINTS
- ALARM ANNUNCIATION & TEXT MESSAGING
- DATA COLLECTION
- DATA TRANSMISSION
- AUTOMATED PUMP CONTROLS
- CHEMICAL INJECTION: ADD-ON CAPABILITY FOR AUTOMATIC CHEMICAL DOSING ADJUSTMENTS

MODULARIZATION

- CAPABLE OF ADDING IN-LINE POLLUTANT SPECIFIC FILTERING SYSTEMS
- UNITS CAN BE PLACED IN SUCCESSION TO INCREASE THE ABILITY TO HANDLE VERY HIGH FLOW RATES

OVERVIEW

KI Environmental Services' newly designed Revolu⁺ION Model CESF-ENCL20-PLC SYSTEM is the state-of-the-art control unit in the stormwater treatment industry. The Revolu⁺ION is designed to treat sediment-laden stormwater, ground water, and industrial wastewater by employing a specified flocculant to the inflow. A single Revolu⁺ION system can reduce influent turbidities reaching upward of 1000 NTU to below 5 NTU at 500 gpm flow rates. The Revolu⁺ION is a highly mobile unit which can easily be moved from location to location. The Revolu⁺ION is the control center for a "plug-n-play" system which allows multiple pollutant constituents of concern to be addressed besides turbidity and pH, such as metals, hydrocarbons and pesticides. The Revolu⁺ION is not only a control unit for the treatment system but also acts as an onsite laboratory, monitoring station, and weather station.

KI environmental services inc.
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Aquatic Effects Monitoring Program– Targeted Study:
Dike Construction Monitoring 2008
Meadowbank Gold Project

Prepared for:

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March 2009

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Project No. AEM-08-01.2

TABLE OF CONTENTS

TABLE OF CONTENTS i
LIST OF TABLES ii
LIST OF FIGURES iii
LIST OF PHOTOS v
LIST OF APPENDICES vi
LIST OF APPENDICES vi
ACKNOWLEDGEMENTS vii
PROFESSIONAL LIABILITY STATEMENT viii
ACRONYMS ix
EXECUTIVE SUMMARY 1

1. INTRODUCTION 1
2. EAST DIKE CONSTRUCTION MONITORING 3
 2.1. Overview 3
 2.2. Methods 4
  2.2.1. Field Turbidity Measurements 4
  2.2.2. Turbidity-TSS Relationships 5
  2.2.3. Routine Turbidity Monitoring 5
  2.2.4. Turbidity Surveys 6
  2.2.5. Water Quality Monitoring 7
  2.2.6. QA/QC 9
 2.3. Results 10
  2.3.1. Routine Turbidity Monitoring 10
  2.3.2. Turbidity Surveys 12
  2.3.3. Water Quality Monitoring 15
  2.3.3.1. Quality Assurance/Quality Control 15
  2.3.3.2. Water Quality 16
 2.4. Summary 18
3. WESTERN CHANNEL DIKE CONSTRUCTION MONITORING 60
 3.1. Overview 60
 3.2. Methods 60
 3.3. Results 61
 3.4. Summary 62
4. REFERENCES 65

LIST OF TABLES

Table 2-1. TSS-turbidity relationships used to predict TSS from field turbidity measurements in 2008 dike construction monitoring............20

Table 2-2. Coordinates (UTM, 14W) and depths for East Dike construction routine monitoring stations. 21

Table 2-3. Mean weekly TSS concentrations (mg/L) at station NE1 from August 1 to October 13, 2008. 22

Table 2-4. Mean weekly TSS concentrations (mg/L) at station SE3 from August 1 to October 13, 2008. 22

Table 2-5. Total suspended solids (TSS, mg/L) at stations near (E201, 278) or in (E232, E233, E234) the outlet from Second Portage Lake to Tehek Lake. 23

Table 2-6. Total suspended solids (TSS, mg/L) for Tehek Lake stations, 30 August 2008 24

Table 2-7. Total suspended solids (TSS, mg/L) for Tehek Lake stations, 11 September 2008. 25

Table 2-8. QAQC data for water parameters, East Dike Construction Monitoring, August and September 2008. 26

Table 2-9. Water chemistry results for East Dike Construction Monitoring, August and September 2008...28

LIST OF FIGURES

Figure 1-1. Site Overview for Dike Construction Monitoring 2008. 2

Figure 2-1. Framework for TSS Monitoring and Management during dike construction (from AEM, 2008a). 30

Figure 2-2. East Dike construction zone, turbidity barriers and routine monitoring station locations. 31

Figure 2-3. Final TSS-turbidity relationship showing all data sources. 32

Figure 2-4. TSS (mg/L) Monitoring Results for West Stations. 33

Figure 2-5. TSS (mg/L) Monitoring Results for Northeast Stations. 34

Figure 2-6. TSS (mg/L) Monitoring Results for Southeast Stations. 35

Figure 2-7. TSS (mg/L) Monitoring Results for High-Value Habitat Stations. 36

Figure 2-8. TSS (mg/L) Profiles for Key Survey Stations – August 3. 37

Figure 2-9. TSS (mg/L) Profiles for Key Survey Stations – August 8. 38

Figure 2-10a,b. TSS (mg/L) Profiles (10a) and Cross Section (10b) for Key Survey Stations – August 13. 39

Figure 2-11. TSS (mg/L) Profiles for Key Survey Stations – August 22. 41

Figure 2-12. TSS (mg/L) Profiles for Key Survey Stations – September 1. .42

Figure 2-13. Second Portage Lake TSS (mg/L) Survey Results (Mean 0 to 5 m) – August 18. 43

Figure 2-14. Second Portage Lake TSS (mg/L) Survey Results (Mean All Depths) – August 18. 44

Figure 2-15. Second Portage Lake TSS (mg/L) Survey Results (Mean 0 to 5 m) – August 22. 45

Figure 2-16. Second Portage Lake TSS (mg/L) Survey Results (Mean All Depths) – August 22. 46

Figure 2-17. Second Portage Lake TSS (mg/L) Survey Results (Mean 0 to 5 m) – September 1. 47

Figure 2-18. Second Portage Lake TSS (mg/L) Survey Results (Mean All Depths) – September 1. 48

Figure 2-19. Second Portage Lake TSS (mg/L) Survey Results (Mean 0 to 5 m) – September 6. 49

Figure 2-20. Second Portage Lake TSS (mg/L) Survey Results (Mean All Depths) – September 6. 50

Figure 2-21. Second Portage Lake TSS (mg/L) Survey Results (Mean 0 to 5 m) – October 13..51

Figure 2-22. Second Portage Lake TSS (mg/L) Survey Results (Mean All Depths) – October 13...52

Figure 2-23. Tehek Lake TSS Monitoring Stations – August 30 and September 11. 53

Figure 2-24. Water quality monitoring station locations, East Dike Construction Monitoring, 2008. 54

Figure 3-1. TSS (mg/L) monitoring results for Western Channel Dike Stations...63

LIST OF PHOTOS

Photo 2-1. East Dike Construction Zone on July 30. 55

Photo 2-2. East Dike in-water construction on July 31.................................55

Photo 2-3. Elevated TSS appears to be contained by turbidity barriers - July 31. 56

Photo 2-4. Analite turbidity probe in action..56

Photo 2-5. William Scottie recording turbidity monitoring results. 57

Photo 2-6. East Dike Construction Zone on August 8. 57

Photo 2-7. East Dike Construction on North Shore. 58

Photo 2-8. East Dike Construction Zone on August 22. 58

Photo 2-9. Drilltrail Arm Remains Clear on August 22. 59

Photo 2-10. Sediment plume in Tehek Lake on August 22 showing strong west-to-east gradient...59

Photo 3-1. Ice-bound Zodiac at station WCT on October 13. 64

Photo 3-2. Western Channel Dike construction zone – October 4. 64

LIST OF APPENDICES

Appendix A: Standard Operating Procedure; Meadowbank Study Lakes; Water & Phytoplankton Sampling.

Appendix B: Daily Summary of TSS Concentrations for Routine and High Value Habitat Monitoring Stations – East Dike.

Appendix C: East Dike Monitoring Water Quality 2008 - Laboratory Reports.

Appendix D: Daily Summary of TSS Concentrations for Routine Monitoring Stations – Western Channel Dike.

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- Molly Brewis and Jaz Pannu (Azimuth) – provided data compilation and entry support on site and participated in several field surveys.

PROFESSIONAL LIABILITY STATEMENT

This report has been prepared by Azimuth Consulting Group Inc. (Azimuth), for the use of Agnico-Eagle Mines Ltd. (AEM), who has been party to the development of the scope of work for this project and understands its limitations. The extent to which previous investigations were relied on is detailed in the report.

In providing this report and performing the services in preparation of this report Azimuth accepts no responsibility in respect of the site described in this report or for any business decisions relating to the site, including decisions in respect of the management, purchase, sale or investment in the site.

This report and the assessments and recommendations contained in it are intended for the sole and exclusive use of AEM.

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This report is intended to provide environmental information to support the Aquatic Effects Management Program (AEMP) for AEM's Meadowbank Project. The AEMP monitoring scope and design was developed in consideration of a specific project development plan. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the proposed development may necessitate modification of the AEMP and may potentially reduce the utility of this baseline data.

The findings contained in this report are based, in part, upon information provided by others. In preparing this report, Azimuth has assumed that the data or other information provided by others is factual and accurate. If any of the information is inaccurate, site conditions change, new information is discovered, and/or unexpected conditions are encountered in future work, then modifications by Azimuth to the findings, conclusions and recommendations of this report may be necessary.

In addition, the conclusions and recommendations of this report are based upon applicable legislation existing at the time the report was drafted. Changes to legislation, such as an alteration in acceptable limits of contamination, may alter conclusions and recommendations.

ACRONYMS

AEM – Agnico-Eagle Mines Ltd.

AEMP – Aquatic Effects Management Program

AWPAR – All Weather Private Access Road

CCME – Canadian Council of Ministers of the Environment

DQO – Data Quality Objective

EAS – Effects Assessment Study

ED – East Dike

GPS – Global Positioning System

HVH – High value habitat

ISQG – Interim Sediment Quality Guidelines

MDL – Method Detection Limit

MMM – Maximum monthly mean

NE – Northeast series of staitons

PEL – Probable Effect Level

QA/QC – Quality Assurance / Quality Control

RPD – Relative Percent Difference

SE – Southeast series of stations

SOP – Standard Operating Procedure

SP – Second Portage Lake

SQG – Sediment Quality Guidelines

STM – Short-term mean

TSS – Total suspended solids

UTM – Universal Transverse Mercator

W – West series of stations

WCD – Western Channel Dike

WCS – Western Channel Dike station in Second Portage Lake

WCT – Western Channel Dike station in Third Portage Lake

EXECUTIVE SUMMARY

Azimuth Consulting Group Inc. (Azimuth) conducted water quality monitoring during dike construction activities at the Meadowbank Gold Project on behalf of Agnico-Eagle Mines Ltd. (AEM) in 2008. As per requirements of the Nunavut Water Board A Licence (2AM-MEA0815) for the project, monitoring followed the framework presented in the *Water Quality Monitoring and Management Plan for Dike Construction and Dewatering at the Meadowbank Mine* (AEM, 2008a). AEM constructed two dikes in 2008, the East Dike and the Western Channel Dike; this report documents receiving environment water quality monitoring results for both.

Dike Construction Monitoring Overview

As per the framework, monitoring focused primarily on total suspended solids (TSS). However, TSS measurements are time intensive and were not possible to conduct on site in 2008. Rather, an empirical relationship between TSS and turbidity was developed so that turbidity, which is easily measured using handheld equipment, could be used to obtain real-time estimates of TSS. Routine monitoring was conducted daily at a specific network of sampling stations (Routine Stations), including three situated near high-value habitat (HVH Stations). TSS trigger values, developed in the monitoring plan (AEM, 2008a) were as follows:

- *Routine Stations* - 50 mg/L for 24-hr average and 15 mg/L for 7-day average.
- *High-Value Habitat Stations* – same as the routine stations, except after September 1, when 25 mg/L for 24-hr average and 6 mg/L 7-day average are in effect.

If elevated TSS concentrations were observed, the network was expanded to monitor plume characteristics or to conduct broad surveys of the receiving environment to determine the extent of the situation. Water quality sampling was also conducted periodically to monitor other parameters (e.g., nutrients, total and dissolved metals).

East Dike Construction Monitoring

Water quality monitoring was conducted between July 30 and October 15, 2008. Routine monitoring stations were situated to the west (W series; impoundment side), northeast (NE series; Second Portage Lake) and southeast (SE series; Second Portage Lake) of the construction area, on the outside of the turbidity barriers. Key results were as follows:

- TSS concentrations increased over the first three weeks of construction, exceeding both the 24-hr and 7-day trigger values, primarily at stations NE1 and SE3. The highest TSS was associated with two specific deep plumes (>8 m) that formed in the deeper basins adjacent to NE1 and SE3 in Second Portage Lake.
- Routine water chemistry sampling for total metals showed aluminum, chromium, copper, iron and lead exceeding CCME water quality guidelines at stations close to the East Dike. Dissolved metals, which are a better indicator of potential biological effects in water, were much lower and typically below CCME guidelines. These results suggest that the metals are primarily associated with introduced particulates.

- By mid August, wind-driven mixing and local currents resulted in increased TSS concentrations throughout much of Second Portage Lake, and extending into Tehek Lake. This process was accelerated during strong wind events, which weakened vertical gradients in the deep plumes off NE1 and SE3 and dissipated TSS throughout the lake.
- By late August, TSS concentrations in the two deep plumes began dropping, likely due to a combination of source reduction, settlement and/or dissipation, and continued to improve throughout the rest of the open water season until freeze-up. TSS concentrations in water discharging to Tehek Lake showed similar improvement.
- Due to the unexpected extent and magnitude of the elevated TSS concentrations in Second Portage Lake, a TSS Effects Assessment Study (EAS) was initiated in September 2008 to evaluate the ecological significance of the situation. The results of this study are reported elsewhere (Azimuth, 2009).
- TSS concentrations in Second Portage Lake met trigger levels for Routine Stations by September 10 and for HVH Stations by September 25.

Western Channel Dike Construction

Water quality monitoring was conducted between September 23 and October 15, 2008. Routine monitoring stations were situated just upstream (i.e., in Third Portage Lake; station WCT) and just downstream (i.e., in the impounded NW arm of Second Portage Lake; station WCS) of the construction area, on the outside of the turbidity barriers. In addition, the W series of stations from East Dike monitoring were also monitored routinely. Note that, as per the approved monitoring framework, TSS triggers for high-value habitats do not apply in the impoundment area. Key results were as follows:

- TSS concentrations at the upstream WCT station were consistent with background concentrations and did not increase over the course of monitoring.
- TSS concentrations at the downstream WCS station increased over the first week of construction, but did not exceed applicable trigger values. Concentrations stabilized or decreased over the remainder of the monitoring period.
- TSS concentrations at the W stations also increased over the first week of construction, but remained below applicable trigger values. Concentrations stabilized or decreased over the remainder of the monitoring period.

1. INTRODUCTION

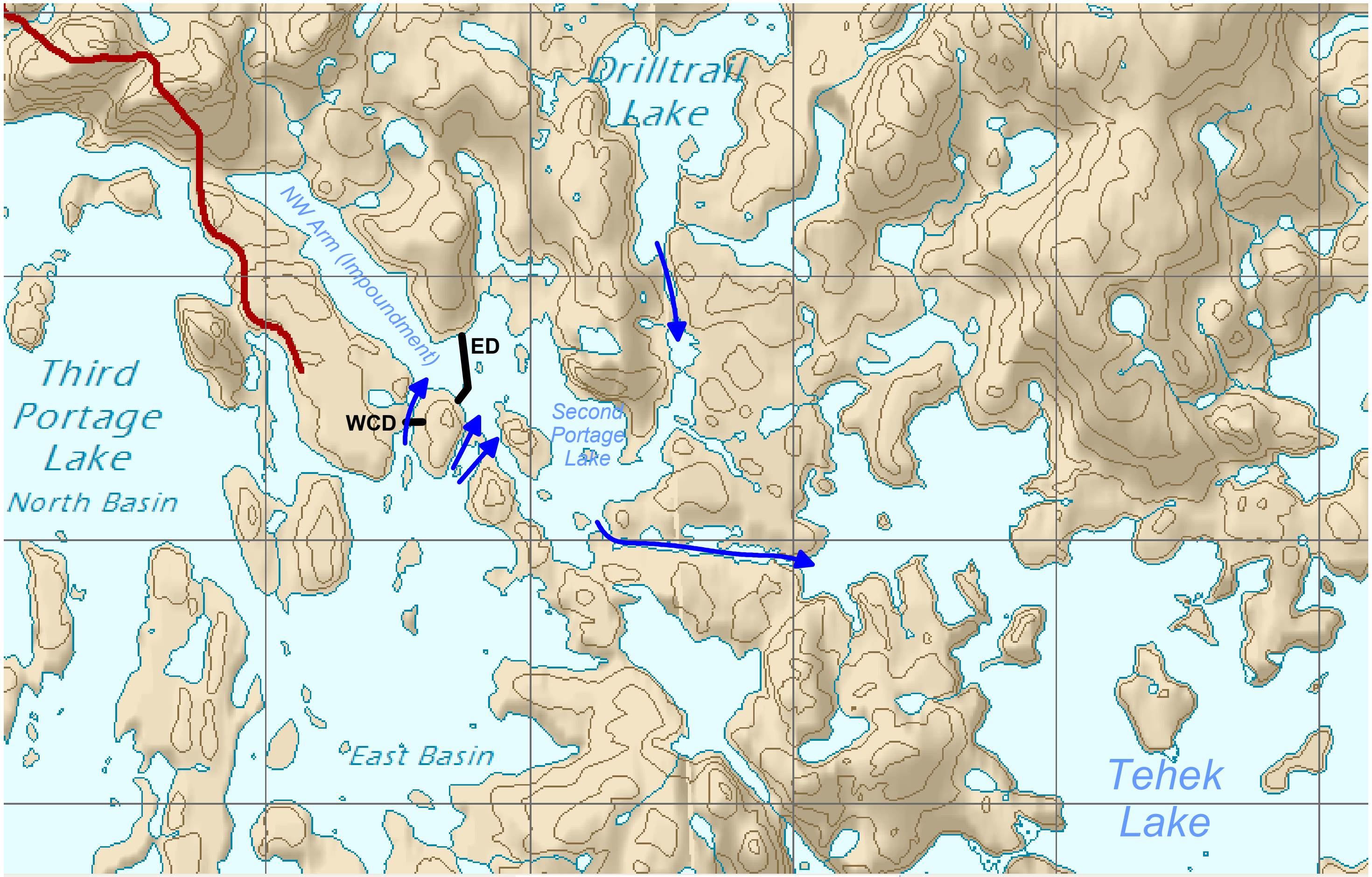
Azimuth Consulting Group Inc. (Azimuth) conducted environmental monitoring of in-water dike construction activities at the Meadowbank Gold Project on behalf of Agnico-Eagle Mines Ltd. (AEM) in 2008. As per the requirements of the Nunavut Water Board A Licence (2AM-MEA0815) for the project, monitoring followed the framework presented in the *Water Quality Monitoring and Management Plan for Dike Construction and Dewatering at the Meadowbank Mine* (AEM, 2008a).

A general overview of the site related to dike construction in 2008 is presented in **Figure 1-1**. The figure includes some of the naming conventions used in this report and shows local hydrology among the lakes.

This report is organized as follows:

- **Section 2** *East Dike Construction Monitoring* – This section covers turbidity and water quality monitoring for the East Dike.
- **Section 3** *Western Channel Dike Construction Monitoring* - This section covers turbidity and water quality monitoring for the Western Channel Dike.

Figure 1-1. Site Overview for Dike Construction Monitoring 2008.



Notes: WCD = Western Channel Dike; ED = East Dike; blue arrows represent lake drainage directions.

2. EAST DIKE CONSTRUCTION MONITORING

2.1. Overview

The monitoring plan for dike construction was documented in the *Water Quality Monitoring and Management Plan for Dike Construction and Dewatering at the Meadowbank Mine* (AEM, 2008a). While water quality monitoring included several parameters (e.g., nutrients and metals measured weekly), total suspended solids (TSS) and turbidity (primarily used as a surrogate for TSS), measured daily (or more frequently), were the major drivers of management actions under the plan. The TSS/turbidity focus allowed for direct monitoring of the key potential stressor in "real time", providing AEM with timely information to support decision making. This approach relied on predicting TSS concentrations from field turbidity measurements.

The plan (AEM, 2008a) presented a decision framework for suspended sediment monitoring during dike construction (**Figure 2-1**), which relied on the following trigger values (see AEM, 2008a for more details):

- *Short Term Maximum* – For durations up to and including 24 hours, we used a TSS threshold of 25 mg/L, to be applied in areas where there is spawning habitat and at times when eggs or larvae would be expected to be present (i.e., this threshold of 25 mg/L was applied to monitoring stations that are located closest to the high value shoal areas[1], starting 1 September 2008). In all other areas and at times when eggs/larvae are not present, we used a TSS threshold of 50 mg/L. For impounded areas (e.g., northwest arm of Second Portage Lake), the threshold of 50 mg/L was applied at all times and in all areas, because any eggs deposited in impoundments would not survive dewatering.
- *Maximum Monthly Mean* – For long-term exposure (i.e., greater than one day and less than a month), we used a monthly mean TSS threshold of 6 mg/L, to be applied in areas where there is spawning habitat and at times when eggs or larvae would be expected to be present (i.e., this threshold of 6 mg/L was applied to monitoring stations targeting the high value shoal areas, starting 1 September 2008). In all other areas and at times when eggs/larvae were not present, we used a TSS threshold of 15 mg/L as a maximum monthly mean. For impounded areas (e.g., northwest arm of Second Portage Lake), the threshold of 15 mg/L was

[1] Three high value shoal areas were identified in close proximity to the construction area; these areas will be subject to a higher level of protection (i.e., lower trigger values for TSS) than other areas during the fall spawning season.

applied at all times and in all areas, because any eggs deposited in impoundments would not survive dewatering.

The plan (2008a) also included the locations of routine monitoring stations, situated approximately 50 m from the turbidity barriers enclosing the East Dike construction zone (**Figure 2-2**). Station types were as follows:

- The west (W) series targeted the impoundment side of the construction zone.
- The northeast (NE) series covered the northeast turbidity barrier.
- The southeast (SE) series addressed the southeast turbidity barrier.
- The high value habitat (HVH) series targeted the three closest high value shoal areas.

To complement data collected during routine monitoring, and particularly when time-weighted (i.e., 24 hrs or 7 days) TSS concentrations at the routine stations exceeded one or both trigger values, targeted turbidity surveys were periodically conducted to better understand specific situations. The scope of these studies ranged from small-scale monitoring of vertical or horizontal plume extent to broad characterization of TSS distribution in Second Portage Lake. Due to the widespread suspended sediment plume that prevailed in the latter part of August and early September, targeted studies were initiated to assess potential ecological effects to key receptors (e.g., phytoplankton, zooplankton and fish); these are discussed in detail in a separate report (Azimuth, 2009).

This report presents the results of the monitoring component of the plan (see **Figure 2-1**); analysis of the primary causes of the elevated TSS is presented in Golder (2009).

2.2. Methods

2.2.1. Field Turbidity Measurements

Turbidity sampling was conducted in the field using McVan's Analite NEP160-3-05R portable turbidity meter/logger with a high sensitivity NEP260 90° probe connected with either a 5-m or 10-m long waterproof cable. The unit has a range (0 to 3000 NTU) easily covering expected environment conditions and is highly precise (resolution varies with subrange as follows: <0.1 to 20 NTU [0.02 NTU], <1 to 200 NTU [0.1 NTU], <10 to 2,000 NTU [1 NTU]) and accurate (repeatability = 2%). This probe measures turbidity following the ISO 7027 method. Meters were calibrated routinely throughout the program.

2.2.2. Turbidity-TSS Relationships

As indicated in the approved monitoring plan (AEM, 2008a) and recommended by DFO (DFO, 2000), TSS was estimated from field turbidity data using an empirical, site-specific relationship between turbidity and TSS field-collected turbidity data. The general form of this relationship was as follows:

$$\text{Log (Turbidity)} = \text{Intercept} + (\text{Slope x Log [TSS]})$$

where turbidity is measured in NTUs and TSS in mg/L.

As site-specific data for Second Portage Lake would not be available until after starting dike construction (i.e., due to the need to have a broad range of turbidity values in order to derive a robust relationship), the monitoring plan (AEM, 2008a) presented an initial TSS-turbidity relationship using paired turbidity/TSS data collected during construction monitoring of the All-Weather Private Access Road (AWPAR) in 2007 (AEM 2008b) and noted that this relationship might be updated if 2008 AWPAR construction data became available. Paired data were collected across a range of turbidity in Second Portage Lake on August 5, 2008; water was collected in a bucket, measured for field turbidity, and then placed in 1-L plastic bottles to be sent to ALS Laboratories in Vancouver for both TSS and turbidity analyses.

Given that the goal of deriving a TSS-turbidity relationship was to facilitate real-time management of suspended sediments in the receiving environment, the regression was updated several times during August as site-specific data became available (**Table 2-1**). Note that the initial TSS-turbidity regression presented in the monitoring plan was updated just prior to starting construction, so it was never actually used to predict TSS concentrations during dike construction monitoring. Given that the initial data sets were based on construction monitoring and covered a range of situations (i.e., rather than a single snapshot of conditions), the underlying data set was amended (i.e., previous data were retained) when new data were available to provide a robust relationship between TSS and turbidity. All the TSS-turbidity data points, grouped by dataset, and the final regression relationship are shown in **Figure 2-3**.

2.2.3. Routine Turbidity Monitoring

As outlined in the plan (AEM, 2008a), routine turbidity monitoring targeted three monitoring events per day (weather/logistics permitting; not all stations necessarily monitored). Anchored floats were deployed at each routine monitoring station to facilitate daily monitoring. GPS coordinates and approximate depths for all stations are presented in **Table 2-2**; stations were situated approximately 50 m outside the turbidity barriers (**Figure 2-2**).

A single monitoring event for a station occurred as follows. The boat would be navigated to a particular station, and depending on wind conditions would remain stationary relative to the station marker (buoy) by shifting the motor in- and out of gear. The boat was not anchored to avoid stirring up bottom sediments. After noting the time and depth (measured with a hand-held Hawk Eye® Digital Sonar), turbidity measurements were recorded at the surface and at each meter through the water column, stopping approximately 0.5 to 1 meter off the bottom (i.e., to avoid inadvertent sediment resuspension). The maximum turbidity value for each profile was also noted as it was the only value used for subsequent calculations.

Data from each monitoring event were reviewed (i.e., to identify any dramatic changes) then entered into an Excel database. The following estimates were calculated daily to provide AEM with up-to-date information on the status of suspended sediments in the impoundment and in the Second Portage Lake receiving environment:

- **Daily Maximum TSS Concentration** – the highest daily turbidity values were used to estimate the maximum TSS concentration for each station. This provided a snapshot of worst case conditions for a particular day.

- **Moving 24-hr Average TSS Concentration** – turbidity values were time-weighted to estimate the mean TSS concentration for each station over the previous 24 hours. This was compared to the *Short-Term Maximum* trigger value.

- **Moving 7-day Average TSS Concentration** – turbidity values were time-weighted to estimate the mean TSS concentration for each station over the previous 7 days. This was compared to the *Maximum Monthly Mean* trigger value.[2]

2.2.4. Turbidity Surveys

Discussed in **Section 2.1**, based on the results of routine monitoring, extensive surveys were conducted in Second Portage Lake to track the extent and magnitude of sediment plumes when elevated TSS concentrations were observed. Monitoring stations were selected on a case-by-case basis to provide adequate coverage of the plume. Plume monitoring was extended to Tehek Lake after elevated TSS concentrations were noted at the discharge point from Second Portage Lake. The monitoring process for each station was similar to routine monitoring.

Survey frequency was dictated by the rate at which plume-related conditions changed over time, which was typically slow unless a major wind event occurred.

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[2] The underlying data used to derive the *Maximum Monthly Mean* trigger value included exposure durations ranging from 24 hrs to a month. Seven days was considered a reasonable time frame over which to derive a mean exposure level to compare to this trigger value. More details on the trigger value derivation process are provided in the plan (AEM, 2008a).

2.2.5. Water Quality Monitoring

Water quality sampling for a range of parameters[3] was prescribed to be conducted approximately every week between early August and late September from a minimum of three routine turbidity monitoring stations (i.e., SE1 – SE3 and NE1 – NE3) in Second Portage Lake. Given the water quality issues that evolved in Second Portage Lake, the program was revised slightly to target specific issues and provide more detailed assessments of water quality. This was conducted less frequently than weekly, but typically included more stations over a broader area (e.g., to complement the broader TSS surveys described in **Section 2.2.4**). This approach provides a more complete view of water chemistry (conventional, nutrients, metals) varied over a larger spatial scale, and how it related to TSS concentrations.

Complete water quality data sets were acquired strategically, based on results of vertical turbidity profiles measured during water quality monitoring events in August and September. Samples were collected either at discrete depths or integrated between surface and 8 m based on results of vertical turbidity data prior to sampling. If large differences were observed between surface and deep water, depth-stratified samples were collected. If profiles were uniform, depth-integrated samples were taken. Stations east of the NE and SE series of stations were added as turbidity spread across Second Portage Lake. Water samples were collected on the following dates and stations:

- *August 9* – Integrated samples were collected at SE2, SE3 and NE2 to characterize typical water quality at stations nearest the dike during early stages of construction, with focus on the southeast corner where the highest TSS concentrations were measured during routing monitoring.
- *August 16* –Integrated samples were again collected at SE2, SE3 and at NE3 (further south) to characterize water quality nearest the dike as construction progressed northwards.
- *August 22* – Monitoring targeted prevailing conditions in the lake and the NE1 and SE3 plumes. Upper water column samples (2 m) were collected from each station. In addition, deep water samples (8 m) were collected from both plume areas. Stratified samples were acquired at E214 (2 m and 8 m) and A3 (2 m and 8 m) and discrete samples at SP (4 m), and SP-2 (2 m).

[3] Water quality sampling parameters included (a) physical parameters - hardness, pH, total dissolved solids, total suspended solids, (b) Anions and nutrients - ammonia, alkalinity – bicarbonate, alkalinity – carbonate, alkalinity – hydroxide, alkalinity – total, chloride, silicate, sulfate, nitrate, nitrite, total kjeldahl nitrogen, ortho phosphate, total phosphate; (c) Organic parameters: chlorophyll a, dissolved organic carbon, total organic carbon; (d) Total and dissolved metals.

- *September 2, 3* – Depth-stratified samples were again collected from E214 (2 m and 8 m) and A3 (2 m and 8 m) to determine chemistry at discrete depth zones. Discrete near-surface samples were acquired from E203 in the east basin and at E201, at the outlet to Tehek Lake. These stations had uniform turbidity. Water chemistry sampling was extended eastwards to characterize a greater part of the lake.
- *September 12* – Discrete samples were acquired from SE2, SE-3 and NE1 (1 m) nearest the dike; sampling at depth did not occur as the deep plumes were no longer present.

All samples were acquired by pumping lake water through a weighted flexible (food-grade silicone) tubing and a diaphragm pump connected to a 12 volt battery. Depending on vertical turbidity measurements, water was collected either from discrete depths or integrated between 0 and 8 m by lowering and raising the hose and mixing the water in a clean HDPE bucket. Integrated samples were pumped from the bucket into the appropriate sampling vessel. Procedures for collecting the water samples are outlined in detail in the AEMP's Standard Operating Procedure (SOP) for Water and Phytoplankton Sampling in **Appendix A**. In general, the procedures were:

- The silicon tubing was weighted (using a plastic-coated lead weight), hung over the side of the boat and the pump was turned on to prime the tubing. Once primed, the pump was allowed to run for at least 2 minutes to thoroughly flush the tubing and to ensure that there was no cross-contamination between stations before water samples were collected.
- Water samples were analyzed for conventional parameters (hardness, conductivity, pH, total dissolved and suspended solids), dissolved anions and nutrients (ammonia, bicarbonate, carbonate, hydroxide, alkalinity, chloride, sulfate, nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate and total phosphate), organics (total and dissolved organic carbon), and total metals concentrations.
- 1-L of water was filtered using a hand vacuum pump through a Whatman ashless filter paper. The filter was preserved with magnesium carbonate, wrapped in tinfoil, frozen and analyzed for chlorophyll-a.

ALS Environmental (Vancouver, BC) provided all of the sampling containers and appropriate preservatives for the water and filter samples. All samples were stored in the dark and kept on ice immediately following collection and during transport to the laboratory. A completed chain-of-custody form accompanied the samples during transport.

All of the measured water chemistry concentrations were tabulated and, when available, screened against the federal Canadian Council of Ministers of the Environment (CCME, 2007) water quality guidelines for the protection of aquatic life. These guidelines are intended to provide a conservative level of protection to freshwater aquatic life from anthropogenic contaminants or other physical changes (suspended solids, temperature).

2.2.6. QA/QC

The objective of quality assurance and quality control (QA/QC) is to assure that the chemical and biological data collected are representative of the material or populations being sampled, are of known quality, are properly documented, and are scientifically defensible. Data quality was assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

Laboratory QA/QC – Data Quality Objectives (DQOs) are numerically definable measures of analytical precision and completeness. Analytical precision is a measurement of the variability associated with duplicate analyses of the same sample in the laboratory. Completeness for this study is defined as the percentage of valid analytical results. Results that were made uncertain due to missed hold times, improper calibration, contamination of analytical blanks, or poor calibration verification results were deemed invalid.

Duplicate results were assessed using the relative percent difference (RPD) between measurements. The equation used to calculate a RPD is:

$$RPD = \frac{(A - B)}{((A + B)/2)} \times 100$$

where: A = analytical result; B = duplicate result.

The laboratory DQOs for this project were:

- Analytical Precision = 25% RPD for concentrations that exceed 10x the method detection limit (MDL).
- Completeness = 95% valid data obtained.

RPD values may be either positive or negative, and ideally should provide a mix of the two, clustered around zero. Consistently positive or negative values may indicate a bias. Large variations in RPD values are often observed between duplicate samples when the concentrations of analytes are very low and approaching the detection limit. The reason for this is apparent if one considers duplicate samples with concentrations of an analyte of 0.0005 and 0.0007 mg/L. In absolute terms, the concentration difference between the two is only 0.0002 mg/L, a very tiny amount; however, the RPD value is 33.3%. This may sometimes lead to a belief that the level of precision is less than it actually is.

Field QA/QC: Turbidity Monitoring – Field QA included consistently adhering to the monitoring program (see **Sections 3.2.1, 3.2.3** and **3.2.4**) and using properly maintained and calibrated instruments (see **Section 3.2.1**).

Field QA/QC: Water Sampling – Field QA standards, as document in **Appendix A**, were maintained throughout water sampling. This included thoroughly flushing the flexible tubing and pump to prevent cross-contamination between stations and rinsing the sample containers with site water prior to sample collection.

Field duplicates, equipment blanks and trip blanks were collected at a subset of stations. The field duplicates were used to assess sampling variability and sample homogeneity; a RPD of 50% for concentrations that exceed 10x the MDL is considered acceptable. Trip blanks and equipment blanks were used to assess whether any trip-related or equipment-related cross contamination may have occurred.

2.3. Results

2.3.1. Routine Turbidity Monitoring

Turbidity monitoring associated with East Dike construction started on 30 July 2008 and ended 13 October 2008, just days prior to freeze-up of Second Portage Lake. A series of photos is provided to help convey certain information (**Photos 2-1 through 2-10**). The daily moving 24-hr and 7-day average TSS[4] concentrations for each routine monitoring station are shown in **Figures 2-4** through **2-7** (results for daily maxima, 24-hr averages and 7-day averages for each routine and high-value habitat station each day are provided in **Appendix B**). Key results were as follows:

- **General** – Field turbidity measurements taken in Second Portage Lake (prior to construction) and in other project lakes suggest background concentrations typically of approximately 0.3 to 1 NTU, which, using the final site-specific TSS-turbidity relationship (see **Figure 2-3**), would equate to approximately 0.2 to 0.6 mg/L TSS (i.e., well below the laboratory detection limit of 3 mg/L for direct TSS measurements).
- **W Stations** – TSS concentrations showed a remarkably similar pattern among stations (**Figure 2-4**): increasing over the first two weeks of construction,

[4] Apart from TSS measurements taken to establish the TSS-turbidity relationship or as part of the water quality sampling, all TSS concentrations reported herein are estimates made from direct monitoring of turbidity (see **Section 2.2** for details).

remaining elevated for approximately a week, then gradually decreasing until late September when sediment inputs from Western Channel Dike construction affected the area. While the Short Term Maximum (STM; 24-hr average trigger of 50 mg/L TSS) was not exceeded at any W stations, the Maximum Monthly Mean (MMM; 7-day average trigger of 15 mg/L TSS) was exceeded for six days at W1 (by up to 2.3 mg/L from August 15 to 22) and for four days at W2 (by less than 1 mg/L from August 21 to 24). Concentrations for all stations generally decreased from late August until late September, at which time they increased slightly (but remained below the trigger values) due to construction-related sediment inputs from the Western Channel Dike (see **Section 3** for details).

- **NE Stations** – TSS concentrations rose rapidly over the first two weeks of construction, particularly at NE1 where both the 24-hr average and 7-day average values exceeded the STM TSS trigger (**Figure 2-5**). This is noteworthy because NE1 was the furthest away from the leading edge of the dike during early construction. The 24-hr and 7-day averages at NE1 peaked at 114 mg/L (August 19) and 74 mg/L (August 24), respectively. Maximum values in profiling at NE1 were usually at depth (e.g., 7 to 10 m), with TSS concentrations in surface waters (e.g., 0 to 3 m) typically much lower. This suggests that a deep plume was created within the construction zone and followed local bathymetric features to the depression just east of NE1 (see **Section 2.3.2** for more discussion of this plume). Maximum TSS concentrations at NE2 and NE3, both of which were shallower (4 to 6 m deep) than NE1 (10 to 11 m deep), were generally about three times lower than NE1 from mid to late August. Only the MMM was exceeded at these stations, with the 7-day averages peaking at 24.4 mg/L for NE2 (August 25/26) and 29.9 mg/L at NE3 (August 31). TSS concentrations at all NE stations decreased after late August and were below both trigger levels by September 10.
- **SE Stations** – TSS concentrations increased substantially during the first two weeks of construction, particularly at SE3 where both the 24-hr and 7-day average values exceeded the STM TSS trigger (**Figure 2-6**). The 24-hr and 7-day average values at SE3 peaked at 456 mg/L (August 19) and 324 mg/L (August 24), respectively. Maximum values in profiling at SE3 were almost always at depth (e.g., 7 to >9 m), with TSS concentrations in surface waters (e.g., 0 to 3 m) typically much lower. Similar to the NE stations, this suggests that a deep plume was created in the construction zone and followed local bathymetric features past SE3 to the depression southeast of SE3 (see **Section 2.3.2** for more discussion of this deep plume). At shallower SE1 (2 m) and SE2 (5 m), maximum TSS concentrations were generally less than half those found at SE3 (10 m) from mid to late August. Both the STM and MMM triggers were exceeded at SE2, with the 24-hr and 7-day average values peaking at 127 mg/L (August 17) and 106 mg/L

(August 20), respectively. Only the MMM was exceeded at SE1, with the 7-day average peaking at 21.4 mg/L (August 26). TSS concentrations at all SE stations began decreasing in late August and were below the applicable trigger levels by September 10.

- **HVH Stations** – TSS concentrations at the HVH stations showed similar patterns (but lower concentrations) to the nearest SE stations (i.e., SE1 for HVH 1 and HVH2; SE3 for HVH3; see **Figure 2-7**). Only the MMM, which changed from 15 mg/L to 6 mg/L on September 1 (see **Section 2.1** for details), was exceeded at the HVH stations; 7-day average values for HVH1, HVH2 and HVH3 peaked at 20 mg/L (August 26), 15.7 mg/L (August 26) and 31 mg/L (August 28), respectively. TSS concentrations at all HVH stations began decreasing in late August and were below the MMM trigger level of 6 mg/L by September 25.

2.3.2. Turbidity Surveys

Targeted surveys were initiated almost immediately after the start of in-water dike construction activities as TSS concentrations (as predicted using field turbidity measurements) started to increase above background concentrations. Surveys ranged from small scale plume delineations (e.g., one or more sampling stations), that were conducted nearly every day when distinct plumes were present, to broad characterization of Second Portage Lake or Tehek Lake, that were conducted every week or so, later into the fall. Overall, these surveys helped to better understand the behavior and fate of suspended sediments in the receiving environment over time.

Routine monitoring identified TSS plumes in the lake depressions near stations SE3 and NE1 (see **Section 2.3.1**). Target surveys were frequently conducted to characterize these plumes and track how they changed over time. Monitoring results for these areas over time are shown in **Figures 2-8** to **2-12**. Mean weekly TSS concentrations by depth are shown for NE1 and SE3 from August 1 to October 13 in **Tables 2-3** and **2-4**. Key insights from these surveys were as follows:

- **NE1 Plume –** With construction of the East Dike starting on the south side of the lake, TSS concentrations were fairly low in this area during the first week of construction (see **Photo 2-6**). Concentrations rose rapidly as the leading edge of the dike approached the north shore (**Photo 2-7**) and remained elevated until late August. The depth profile figures (**Figures 2-8** to **2-12**) and **Table 2-3** show that the most elevated TSS concentrations are limited to deep water, with the upper water column generally much lower. The mass of suspended sediment in the deep water throughout the NE1 basin created a density barrier that was fairly resistant to wind mixing and prevented vertical mixing of highly turbid deep water with less turbid surface water except for strong wind events. Notwithstanding, TSS concentrations throughout the water column exceeded the MMM trigger of 15 mg/L for about three weeks. As seen in **Figure 2-12** and **Table 2-3**, by the last week of August TSS concentrations were much lower and were no longer stratified with depth, likely the result of reduced source material, settlement and wind-driven dispersion. Concentrations continued to decrease throughout the remainder of the monitoring period.

- **SE3 Plume** – TSS gradually increased above background concentrations during the first week of construction, again, particularly at depth (see **Figure 2-8** and **2-9**). Concentrations increased dramatically through the second and third weeks of construction, with extremely elevated TSS concentrations at depth (**Figures 2-10a**, **2-10b** and **2-11**; **Table 2-4**). The vertical stratification is apparent in the cross-section shown through the plume on August 13 (**Figure 10b**). Similar to the deep NE1 plume, this deep, highly turbid water was largely constrained by the bathymetric depression southeast of SE3 and was fairly resistant to wind-driven mixing. While TSS concentrations were significantly lower in the upper water column (e.g., top 5 m) relative to the deep plume, they were still higher in this area (i.e., constrained by the large island and the peninsula separating Third Portage and Second Portage lakes) than in other areas on the east side of the dike and they exceeded the MMM trigger (usually by a factor of 2 or less) for about four weeks. By the last week of August TSS concentrations were much lower and no longer stratified with depth (**Figure 2-12** and **Table 2-4**). The weakening of the plume was likely due to decreased source material, settlement and wind-driven dispersion. Concentrations continued to decrease throughout the remainder of the monitoring period.

More extensive surveys were conducted to characterize TSS concentrations throughout Second Portage Lake (and into Tehek Lake) to monitor temporal and spatial dynamics of TSS distribution in the lakes. Survey results (show as mean TSS concentrations over top 0 to 5 m and mean TSS concentration over entire water column) for select dates (August 18, August 22, September 1, September 6, and October 13) are shown for Second Portage Lake in **Figures 2-13** to **2-22**. Key results were as follows (note: these contour maps are intended to show very general patterns; the locations of specific contour lines, particularly in areas without monitoring locations, will be variable):

- **August 18 –** Nearly three weeks after starting construction of East Dike, TSS concentrations in the upper water column (0 to 5 m) were well above background throughout most of the lake (**Figure 2-13**), with the exception of the arm extending up to Drilltrail Lake, which is referred to as Drilltrail Arm. Drilltrail Arm receives inflow from the Wally Lake system to the north (see **Figure 1-1**), which essentially acted as a barrier to the ingress of TSS-rich waters from the main portion of Second Portage Lake. About half of the lake had TSS concentrations exceeding the MMM trigger of 15 mg/L. The whole water column mean TSS concentration map shows the approximate extent of the NE1 and SE3 plumes (**Figure 2-14**). Note that while **Figure 2-14** shows a portion of the main body of the lake with TSS concentrations less than 5 mg/L, this is likely an artifact of the contouring process. Apart from the plume zones with very high TSS at depth, most of the lake is consistent with upper water column results, showing well-mixed conditions.

- **August 22** – A strong wind event occurred on August 19/20, with winds gusting over 40 kph. Accelerated vertical and horizontal mixing associated with this event resulted in increased TSS concentrations in the upper water column throughout much of Second Portage Lake (**Figure 2-15**; **Photo 2-8**). Concentrations exceeded the MMM trigger at all locations sampled. Note that extension of the 15 to 20 mg/L zone into Drilltrail Arm is an artifact due the lack of stations in that area during this monitoring event; **Photo 2-9** confirms clear water in Drilltrail Arm on August 22 despite the strong wind-driven mixing. Results for the whole water column (**Figure 2-16**) still show the influence of the stratified NE1 and SE3 plumes on the mean TSS concentrations for those two areas (although far less than shown in **Figure 2-14**).
- **September 1, September 6 and October 13** – As discussed above for the surveys targeting plume dynamics, conditions improved significantly in the last week of August. Vertical stratification of TSS concentrations broke down in the plume zones (as seen comparing **Figure 2-17** and **2-18**) and became vertically mixed. While there was still a general gradient from the East Dike (higher) to the southeast (lower), TSS concentrations by early September were less than the MMM trigger in most of Second Portage Lake (**Figures 2-17** through **2-20**). The 6 mg/L contour line was also included on these maps to show the approximate extent of TSS concentrations exceeding the MMM for high-value habitat areas, which was applicable starting September 1. As discussed previously, conditions throughout the lake continued to improve, with TSS concentrations less than 5 mg/L at all stations by the final monitoring event on October 13 (**Figures 2-21** and **2-22**; note that no contours are shown since all TSS concentrations were below the 5 mg/L contour, which was the lowest on the scale).

The preceding results show the extent of elevated TSS concentrations in Second Portage Lake and how the situation evolved over time. Recognizing the potential for turbid water to be discharged to Tehek Lake, the broad surveys usually included monitoring stations situated in Second Portage Lake immediately upstream from the outlet to Tehek Lake (see **Figures 1-1** and **2-2** for local an overview of the area and a more detailed map, respectively). Monitoring profile results of TSS concentrations for these stations are shown in **Table 2-5**. TSS concentrations were close to or exceeded the MMM trigger for approximately one week prior to decreasing over the remainder of the monitoring period.

Surveys to determine the extent of elevated TSS in Tehek Lake were conducted on August 30 (**Table 2-6**) and September 11 (**Table 2-7**); station locations are shown in **Figure 2-23**. During the first monitoring event, TSS concentrations in the initial basin (i.e., up to and including the area surrounding station TK-5) were above background concentrations, but below the MMM trigger value of 15 mg/L. There was a distinct west-to-east gradient in this basin extending from the inlet area (8 to 12 mg/L at TK-2) to stations THK1002 and TK-5 (2 mg/L) (see also in **Photo 2-8** for August 22). Due to helicopter-related time constraints, the extent of the first survey was insufficient to show where TSS concentrations in Tehek Lake returned to background concentrations.

TSS concentrations for the second monitoring event were generally lower than the first event, but showed a more extensive area of elevated TSS concentrations in the initial basin. The Second Portage Lake outlet data (**Table 2-5**; i.e., 8 to 9 mg/L at the Second Portage Lake outlet) are consistent with TSS concentrations measured in the western portion of the initial basin (i.e., near TK-2 and THK1000). While the west-to-east gradient was much weaker across the basin, the eastern station THK1002 had 6 mg/L TSS, which could have extended even further east (TK-5 was not sampled). The survey did confirm background TSS concentrations of 0.4 to 0.6 mg/L at stations TK-9 and TK-10.

Given that the extent of elevated concentrations was greater in the second monitoring event, and that TSS concentrations were steadily improving in Second Portage Lake between the two events, it is unlikely that the zone of elevated TSS in Tehek Lake ever extended beyond TK-9 and TK-10.

2.3.3. Water Quality Monitoring

2.3.3.1. Quality Assurance/Quality Control

QA/QC procedures consisted of a combination of careful field collection and sample handling, the collection of field duplicate samples and the analysis of laboratory replicates and standard reference materials. Results of the QA/QC analysis of water chemistry parameters from Second Portage Lake are presented in **Table 2-8**.

ALS Environmental is an analytical laboratory accredited by the Canadian Association of Environmental Analytical Laboratories. This accreditation ensures that laboratories achieve and demonstrate the highest levels of technical and management excellence for their services. Laboratory QA/QC procedures performed on the water and sediment samples met all of the laboratory's internal data quality objectives for precision and completeness defined for this project.

Duplicate water samples for all parameters were collected from station A3 on September 3. Results of the RPD analysis show that measured concentrations in the field duplicate samples showed a high level of consistency with the original samples with none of the parameters exceeding the DQO (i.e., RPD < 50%). Although total suspended solids concentrations in the original (12.7 mg/L) and duplicate (9.7 mg/L) samples varied within the DQO (RPD=27) this difference was sufficient to cause similar variation in RPD values for many metals between original and duplicate samples because of the very strong positive correlation between suspended sediments in the water column and total metals (see **Section 2.3.3.2** below). RPD values were zero or very low for all dissolved metals all metals except the common salts (calcium, magnesium, and manganese) were below laboratory DLs.

Internal QA/QC was performed by the laboratory on randomly chosen samples for select parameters (i.e., not all parameters are duplicated from individual samples; hence the titling 'various basins'). None of the RPDs for the laboratory duplicates exceeded the DQO of 25%.

Finally, measured concentrations in travel and equipment blanks were also consistently below detection limits for each of the three sampling events, with the exception of only two parameters. The concentration of ammonia in a single travel blank and DOC in a single equipment blank rinse slightly exceeded DLs. Exceedences were rare and very small by comparison and do not suggest that contamination is an issue. Technically, no parameter measured in a travel blank should exceed detection. This was discussed with the laboratory and the reason for this exceedence could not be identified as there did not appear to be contamination of any other samples. Notwithstanding this, all of the measured concentrations met the QA/QC data quality objectives for the project.

2.3.3.2. Water Quality

Water quality monitoring stations for each sampling event are shown in **Figure 2-24**. Sampling started on August 9, when depth-integrated sampling was conducted at SE2, SE3 and NE2 (**Table 2-9**). Laboratory-measured TSS concentrations in the samples ranged from 3.9 mg/L at NE2 to 7.4 mg/L at SE3, so were quite low relative to later in August. Total aluminum was the only parameter to exceed CCME guidelines in these three samples. Dissolved aluminum concentrations, however, were much lower. Only one of the dissolved samples exceeded the CCME guidelines, but only because the pH in that sample was marginally (and likely anomalously so) below pH 6.5 (i.e., the point at which a much lower guideline takes effect).

Depth-integrated water samples were also collected on August 16 at SE2, SE3, NE1, and NE3. Laboratory-measured TSS concentrations in these samples ranged from 20.9 mg/L at NE3 to 40.7 mg/L at NE1. Relative to August 9, there was a general pattern of correlation between TSS concentrations and certain parameters (e.g., nutrients and metals). This is not surprising considering that freshly quarried rock was used for dike construction. While certain nutrients were elevated (e.g., ammonia, nitrate, total Kjeldahl nitrogen, and total phosphate), none exceeded CCME guidelines. Total metals concentrations were higher than CCME guidelines for aluminum, chromium, copper, iron, and lead. Again, dissolved concentrations of all metals were low and below CCME guidelines. The only exceptions were aluminum, which exceeded the guidelines by a factor of two or less, and iron, which barely exceeded the guideline at NE1. These results indicate that metals are primarily particulate-bound and not in the dissolved phase, which is considered to be a much better indicator of potential adverse effects to aquatic life.

As discussed in **Sections 2.3.1** and **2.3.2**, daily turbidity monitoring revealed that deep plumes of turbid water developed in the bathymetric depressions off NE1 and SE3 in mid August. The vertical density gradients were so strong that these areas resisted wind-driven mixing with the upper water column. Water samples were acquired from both surface and deep waters on August 22 and September 2/3 to characterize the chemistry of both layers (**Table 2-9**). As seen on August 22, stratification of the water column in these discrete areas had a profound effect on many aspects of water quality as evidenced by differences between surface and 8 m depth samples at E214 (see **Figure 2-24**). Laboratory-measured TSS concentration in this sample was 378 mg/L. Similar to earlier results, a number of nutrients (ammonia, nitrite, total Kjeldahl nitrogen, phosphate, and total organic carbon) were also roughly correlated with TSS concentrations. None of the nutrients, however, exceeded CCME water quality guidelines. Total metals concentrations were also high at this station/depth as aluminum, cadmium, chromium, copper, iron, lead, nickel, silver and zinc exceeded the CCME (2007) guidelines for the protection of aquatic life. Fortunately, this zone of highly turbid, high metals water was spatially small and discrete. In addition, despite high total metals concentrations, dissolved concentrations of all metals were mostly below detection limits and below CCME guidelines.

The September 2/3 sampling event confirms the lack of stratification observed in Second Portage Lake by the end of August (see **Section 2.3.1** and **2.3.2**). Laboratory-measured TSS concentrations ranged between 10.7 and 15.2 mg/L and were fairly consistent between depths within stations E214 and A3. Not surprisingly, the drop in TSS concentrations also resulted in a drop in total metals concentrations, but still had exceedences above the CCME guidelines. Again, dissolved metals concentrations were very low and did not exceed CCME guidelines.

The general trend of improvement seen by September 2/3 continued to September 12. While this was documented in the more intensive turbidity monitoring (**Section 2.3.1** and **2.3.2**), laboratory-measured TSS concentrations were more variable, ranging from below detection limit (<3 mg/L) at SE3 to 26.2 mg/L at SE2. The latter result may reflect a highly localized occurrence as it is not reflective of the general conditions observed over that time. Again, only total metals concentrations exceeded CCME guidelines.

The pattern observed for metals (i.e., high total metals and very low dissolved metals) indicates that the observed metals were largely bound to suspended particulates (e.g., TSS). This pattern was consistent even in the most turbid water sampled, with laboratory-measured TSS at 378 mg/L. Dissolved metals are considered a much better indicator of potential effects to aquatic life in the water column; the results suggest that direct toxic effects, even in the highly turbid water, are unlikely. The highest CCME exceedence for dissolved metal was approximately 2 fold for aluminum (excluding the sample where pH was anomalously low).

While the effects of sediment-bound metals in the water column may be unlikely, settlement of this material remains a concern due to physical smothering and potential toxicity. The potential effects (both chemical and physical) of settled sediments are discussed further in the EAS report (Azimuth, 2009).

2.4. Summary

Water quality monitoring for East Dike construction started on 30 July 2008 and ended 13 October 2008, just days prior to the freeze up of Second Portage Lake. As stipulated in the monitoring plan (AEM, 2008a), monitoring focused primarily on TSS, but also included periodic sampling for a range of other parameters (e.g., nutrients and metals). Key results were as follows:

- TSS concentrations increased over the first three weeks of construction, exceeding both the 24-hr and 7-day trigger values, primarily at stations NE1 and SE3. The highest TSS was associated with two specific deep plumes (>8 m) that formed in the deeper basins adjacent to NE1 and SE3 in Second Portage Lake. Surface concentrations southeast of SE3, while much lower than at depth, were also generally higher than surface concentrations elsewhere.
- Routine water chemistry sampling for total metals showed aluminum, chromium, copper, iron and lead exceeding CCME water quality guidelines at stations close to the East Dike. Dissolved metals, which are a better indicator of potential biological effects in water, were much lower and typically below CCME guidelines. These results suggest that the metals are primarily associated with introduced particulates.

- By mid August, wind-driven mixing and local currents resulted in increased TSS concentrations throughout much of Second Portage Lake, and extending into Tehek Lake. This process was accelerated during strong wind events, which weakened vertical gradients in the deep plumes off NE1 and SE3 and dissipated TSS throughout the lake.
- By late August, TSS concentrations in the two deep plumes began dropping, likely due to a combination of source reduction, settlement and/or dissipation, and continued to improve throughout the rest of the open water season until freeze-up. TSS concentrations in water discharging to Tehek Lake showed similar improvement.
- Due to the unexpected extent and magnitude of the elevated TSS concentrations in Second Portage Lake, a TSS Effects Assessment Study (EAS) was initiated in September 2008 to evaluate the ecological significance of the situation. The results of this study are reported elsewhere (Azimuth, 2009).
- TSS concentrations in Second Portage Lake met trigger levels for Routine Stations by September 10 and for HVH Stations by September 25.

Table 2-1. TSS-turbidity relationships used to predict TSS from field turbidity measurements in 2008 dike construction monitoring.

Data Source	Dates Used in Monitoring Program	Number of New Samples	Total Number of Samples	Intercept	Slope	r^2	p-value
2007 AWPAR	Not used[1]	38	38	-0.089	1.19	0.86	<0.001
Above + early June 2008[2]	Aug 1 - 7	20	58	0.151	1.18	0.79	<0.001
Above + late June 2008[3]	Aug 7 - 13	33	91	0.237	1.27	0.8	<0.001
Above + Aug 2008[4]	Aug 13 - Oct 15	34	125	0.273	1.20	0.79	<0.001

Notes:

1. Regression updated prior to starting East Dike construction monitoring.
2. Early June 2008 data collected by AEM at various locations around the mine site.
3. Late June 2008 data collected by AEM at AWPAR quarries and around the mine site.
4. Second Portage data collected 5 August 2008 by Azimuth.

Table 2-2. Coordinates (UTM, 14W) and depths for East Dike construction routine monitoring stations.

Station	Easting	Northing	Water Depth[1] (m)
W1	639230	7214337	6.1
W2	639230	7214222	6.1
W3	639220	7214097	7.1
W4	639215	7213977	8.1
NE1	639500	7214480	11.1
NE2	639520	7214370	5.1
NE3	639545	7214260	7.1
SE1	639550	7214025	3.1
SE2	639505	7213900	4.1
SE3	639460	7213770	8.1
HVH1	639641	7214019	3.1
HVH2	640043	7213782	3.1
HVH3	639716	7213372	7.1

Notes:

[1] Water depth was calculated based on a surface water elevation of 133.1 masl.

Table 2-3. Mean weekly TSS concentrations (mg/L) at station NE1 from August 1 to October 13, 2008.

	NE1 - Mean TSS (mg/L)									
	AUG					SEP				OCT
Depth (m)	**1-7**	**8-14**	**15-21**	**22-28**	**29-4**	**5-11**	**12-18**	**19-25**	**26-2**	**3-13**
0	1	5	22	24	17	11	7	6	4	3
1	2	6	22	23	18	11	7	6	4	3
2	2	6	23	24	17	11	7	6	5	3
3	2	6	23	25	17	12	7	6	4	3
4	2	6	25	25	17	12	7	6	4	3
5	2	7	28	26	18	12	7	6	5	3
6	2	8	30	28	18	12	8	6	5	4
7	2	10	34	27	18	12	7	6	4	4
8	3	13	41	30	18	12	7	6	5	3
9	4	16	48	38	17	12	8	6	5	4
10	4	29	**73**	**59**	18	12	8	6	5	3

Notes: **x** (grey) = exceeds 7-day average trigger value of 15 mg/L
x (black) = exceeds 24-hr average trigger value of 50 mg/L

Table 2-4. Mean weekly TSS concentrations (mg/L) at station SE3 from August 1 to October 13, 2008.

	SE3 - Mean TSS (mg/L)									
	AUG					SEP				OCT
Depth (m)	**1-7**	**8-14**	**15-21**	**22-28**	**29-4**	**5-11**	**12-18**	**19-25**	**26-2**	**3-13**
0	6	11	31	25	18	12	7	6	4	3
1	7	13	31	25	18	12	7	6	4	3
2	7	13	33	25	18	12	7	6	4	3
3	8	15	34	24	18	12	7	6	4	3
4	7	17	34	26	18	12	7	6	4	3
5	10	22	39	29	18	12	7	6	4	3
6	13	39	**74**	33	18	12	7	6	4	3
7	12	**175**	**154**	**59**	18	12	7	6	4	3
8	13	**187**	**239**	**123**	18	12	7	6	4	3
9		**187**	**351**		15	11	8			

Notes: **x** (grey) = exceeds 7-day average trigger value of 15 mg/L
x (black) = exceeds 24-hr average trigger value of 50 mg/L

Table 2-5. Total suspended solids (TSS, mg/L) at stations near (E201, 278) or in (E232, E233, E234) the outlet from Second Portage Lake to Tehek Lake.

Depth	E201 16-Aug 15:14	E201 18-Aug 15:05	E201 21-Aug 15:35	E201 22-Aug 15:51	E201 23-Aug 8:59	E232 23-Aug 9:08	E233 23-Aug 9:25	E234 23-Aug 9:32	E201 25-Aug 8:55	278 1-Sep 9:25	278 6-Sep 9:30	E201 9-Sep 14:11	E201 30-Sep 8:51	278 11-Oct 16:55	278 13-Oct 13:56
0	14	12	18	20	23	19	18	19	13	12	8	10	5	4	3
1	15	11	18		23				14	11	8	9	4		
2	16	10	17	20	22				14	10	9	8	5	3	3
3		14	16		23				14			9	4		
4		15	17	21	23				14			9	4		
5					22										

Notes: x (grey shading) = exceeds 7-day average trigger value of 15 mg/L

x (black shading) = exceeds 24-hr average trigger value of 50 mg/L

Stations: E201 (640638, 7212630) and 278 (640698,7212628) are in 2PL just upstream from the outlet to Tehek.

E232 (640731,7212588), E233 (640838,7212506) and E234 (641047,7212535) were taken in the channel between 2PL and Tehek.

Table 2-6. Total suspended solids (TSS, mg/L) for Tehek Lake stations, 30 August 2008

Depth	TK-2	THK1000	THK1004	THK1001	TK1003	THK1005	THK1006	TK-4	TK-3	THK1002	TK-5
0	9	9	7	5	5	6	3	5	3	2	2
1	8	9	8	5	5	5	3	5	3	2	2
2	12	9	8	5	5	5	3	5	4	3	2
3	12	9	7	5	4	5	4	5	4	2	2
4			6	5	4		4	5	4	2	
5				5	4		3	5	5	2	
6				6	5			5	5	2	
7									4	2	
8									4		
9											
10											

Notes:

	x	= exceeds 7-day average trigger value of 15 mg/L
	x	= exceeds 24-hr average trigger value of 50 mg/L

Table 2-7. Total suspended solids (TSS, mg/L) for Tehek Lake stations, 11 September 2008.

Depth	TK-2	THK1000	THK1004	THK1001	THK1003	THK1005	THK1006	TK-3	THK1002	TK-9	TK-10
0	8	8	6	6	6	6	6	6	6	0.6	0.5
1	8	8		6		6			6		
2	8	8	6	6	6	6	6	6	6	0.6	0.4
3		8		6		6			6		
4		8	6	6	6		6	6	6	0.6	0.4
5		8		7			6		6		
6			6		6			6	6	0.6	0.5
7									6		
8					6			6		0.6	0.4
9											
10					6			6			

Notes: **x** (grey shading) = exceeds 7-day average trigger value of 15 mg/L

x (black shading) = exceeds 24-hr average trigger value of 50 mg/L

Table 2-8. QA/QC data for water parameters, East Dike Construction Monitoring, August and September 2008.

	East Dike - Northeast			Various Basins / Depths			Various Basins / Depths			Travel Blanks				Equipment Blanks		
	A3-Deep	Field Dup	RPD	Original	Laboratory Duplicate	RPD	Original	Laboratory Duplicate	RPD							
	3-Sep-08	3-Sep-08	(%)	August		(%)	September		(%)	16-Aug-08	22-Aug-08	3-Sep-08	12-Sep-08	18-Aug-08	22-Aug-08	12-Sep-08
CONVENTIONAL PARAMETERS																
Physical Tests																
Conductivity (µS/cm)	28.6	29.4	-2.8	-	-	-	26.5	25.9	2.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Hardness (mg/L)	11.7	12.7	-8.2	-	-	-	-	-	-	<0.70	<0.70	<0.70	<0.70	<0.50	<0.70	<0.50
pH	7.33	7.35	-0.3	5.68	5.72	-0.7	5.65	5.66	-0.2	5.71	5.68	5.65	5.54	5.73	5.74	5.36
Total Suspended Solids (mg/L)	12.7	9.70	27	-	-	-	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids (mg/L)	32	28	13	-	-	-	22	21	4.7	<10	<10	<10	<10	<10	<10	<10
Anions & Nutrients (mg/L)																
Alkalinity - Bicarbonate	8.6	8.4	2.4	-	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity - Carbonate	<2.0	<2.0	0	-	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity - Hydroxide	<2.0	<2.0	0	-	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity - Total	8.6	8.4	2.4	<2.0	<2.0	0	8.5	8.6	-1.2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Ammonia (as N)	0.029	0.030	-3.4	0.18	0.21	-14	0.026	0.026	0	<0.020	0.027	<0.020	<0.020	0.053	<0.020	<0.020
Chloride	0.57	0.66	-15	<0.50	<0.50	0	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Nitrate (as N)	0.0634	0.0626	1.3	0.0280	0.0281	-0.4	-	-	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0012	0.0013	-8.0	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	0.19	0.22	-16	0.086	0.092	-6.7	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Ortho Phosphate (as P)	<0.0010	0.0010	0	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate (as P)	0.0235	0.0237	-0.8	0.0340	0.0340	0	<0.0020	<0.0020	0	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicate (as SiO_2)	<1.0	<1.0	0	<1.0	<1.0	0	<1.0	<1.0	0	-	-	<1.0	<1.0	-	-	-
Sulfate (SO_4)	2.28	2.28	0	2.18	2.18	0	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
ORGANIC / INORGANIC CARBON																
Dissolved Organic Carbon (mg/L)	2.12	2.14	-0.9	1.55	1.54	0.6	2.12	2.15	-1.4	<0.50	-	-	-	-	0.760	-
Total Organic Carbon (mg/L)	1.82	2.13	-16	1.41	1.39	1.4	1.82	1.79	1.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
PLANT PIGMENTS																
Chlorophyll a (µg)	0.214	0.250	-16	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL METALS (mg/L)																
Aluminum	0.994	1.37	-32	-	-	-	0.977	1.00	-2.3	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-
Antimony	<0.00050	<0.00050	0	-	-	-	<0.00050	<0.00050	0	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-
Arsenic	0.00061	0.00070	-14	-	-	-	0.00054	0.00058	-7.1	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-
Barium	<0.020	<0.020	0	-	-	-	<0.020	<0.020	0	<0.020	<0.020	<0.020	<0.020	-	<0.020	-
Beryllium	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-
Boron	<0.10	<0.10	0	-	-	-	<0.10	<0.10	0	<0.10	<0.10	<0.10	<0.10	-	<0.10	-
Cadmium	<0.000017	<0.000017	0	-	-	-	<0.000017	<0.000010	-	<0.000017	<0.000017	<0.000017	<0.000017	-	<0.000017	-
Calcium	3.20	3.22	-0.6	-	-	-	3.04	2.91	4.4	<0.10	<0.10	<0.10	<0.10	-	<0.10	-
Chromium	0.0034	0.0046	-30	-	-	-	0.0034	0.0034	0	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-
Cobalt	0.00060	0.00072	-18	-	-	-	0.00055	0.00058	-5.3	<0.00030	<0.00030	<0.00030	<0.00030	-	<0.00030	-
Copper	0.0032	0.0036	-12	-	-	-	0.0029	0.0030	-3.4	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-
Iron	1.13	1.48	-27	-	-	-	1.12	1.10	1.8	<0.030	<0.030	<0.030	<0.030	-	<0.030	-
Lead	0.00093	0.00099	-6.2	-	-	-	0.00080	0.00087	-8.4	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-
Lithium	<0.0050	<0.0050	0	-	-	-	<0.0050	<0.0050	0	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-
Magnesium	1.28	1.44	-12	-	-	-	1.27	1.24	2.4	<0.10	<0.10	<0.10	<0.10	-	<0.10	-
Manganese	0.0227	0.0261	-14	-	-	-	0.0215	0.0226	-5.0	<0.00030	<0.00030	<0.00030	<0.00030	-	<0.00030	-
Mercury	<0.000020	<0.000020	0	-	-	-	<0.000020	<0.000020	0	<0.000020	<0.000020	<0.000020	<0.000020	-	<0.000020	-
Molybdenum	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-
Nickel	0.0026	0.0034	-27	-	-	-	0.0025	0.0026	-3.9	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-
Potassium	<2.0	<2.0	0	-	-	-	<2.0	<2.0	0	<2.0	<2.0	<2.0	<2.0	-	<2.0	-
Selenium	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-
Silver	<0.000020	<0.000020	0	-	-	-	0.000023	<0.000020	14	<0.000020	<0.000020	<0.000020	<0.000020	-	<0.000020	-
Sodium	<2.0	<2.0	0	-	-	-	<2.0	<2.0	0	<2.0	<2.0	<2.0	<2.0	-	<2.0	-
Thallium	<0.00020	<0.00020	0	-	-	-	<0.00020	<0.00020	0	<0.00020	<0.00020	<0.00020	<0.00020	-	<0.00020	-
Tin	<0.00050	<0.00050	0	-	-	-	<0.00050	<0.00050	0	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-
Titanium	0.042	0.058	-32	-	-	-	0.042	0.041	2.4	<0.010	<0.010	<0.010	<0.010	-	<0.010	-
Uranium	0.00046	0.00049	-6.3	-	-	-	0.00040	0.00043	-7.2	<0.00020	<0.00020	<0.00020	<0.00020	-	<0.00020	-
Vanadium	0.0017	0.0023	-30	-	-	-	0.0017	0.0017	0	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0010	-
Zinc	0.0076	0.0082	-7.6	-	-	-	0.0053	0.0064	-19	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-

Table 2-8 con't. QA/QC data for water parameters, East Dike Construction Monitoring, August and September 2008.

	East Dike - Northeast			Various Basins / Depths			Various Basins / Depths			Travel Blanks				Equipment Blanks		
	A3-Deep 3-Sep-08	Field Dup 3-Sep-08	RPD (%)	Original August	Laboratory Duplicate	RPD (%)	Original September	Laboratory Duplicate	RPD (%)	16-Aug-08	22-Aug-08	3-Sep-08	12-Sep-08	18-Aug-08	22-Aug-08	12-Sep-08
DISSOLVED METALS (mg/L)																
Aluminum	0.0751	0.0651	14	-	-	-	0.0345	0.0350	-1.4	-	-	-	-	-	<0.0050	-
Antimony	<0.00050	<0.00050	0	-	-	-	<0.00050	<0.00050	0	-	-	-	-	-	<0.00050	-
Arsenic	<0.00050	<0.00050	0	-	-	-	<0.00050	<0.00050	0	-	-	-	-	-	<0.00050	-
Barium	<0.020	<0.020	0	-	-	-	<0.020	<0.020	0	-	-	-	-	-	<0.020	-
Beryllium	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	-	-	-	-	-	<0.0010	-
Boron	<0.10	<0.10	0	-	-	-	<0.10	<0.10	0	-	-	-	-	-	<0.10	-
Cadmium	<0.000017	<0.000017	0	-	-	-	<0.000017	<0.000010	-	-	-	-	-	-	<0.000017	-
Calcium	3.26	3.57	-9.1	-	-	-	2.95	2.97	-0.7	-	-	-	-	<0.050	<0.10	<0.050
Chromium	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	-	-	-	-	-	<0.0010	-
Cobalt	<0.00030	<0.00030	0	-	-	-	<0.00030	<0.00030	0	-	-	-	-	-	<0.00030	-
Copper	<0.0010	0.0010	0	-	-	-	<0.0010	<0.0010	0	-	-	-	-	-	<0.0010	-
Iron	0.057	0.053	7.3	-	-	-	<0.030	0.030	0	-	-	-	-	-	<0.030	-
Lead	<0.00050	<0.00050	0	-	-	-	<0.00050	<0.00050	0	-	-	-	-	-	<0.00050	-
Lithium	<0.0050	<0.0050	0	-	-	-	<0.0050	<0.0050	0	-	-	-	-	-	<0.0050	-
Magnesium	0.86	0.93	-7.8	-	-	-	0.81	0.81	0	-	-	-	-	<0.10	<0.10	<0.10
Manganese	0.00435	0.00430	1.2	-	-	-	0.00417	0.00411	1.4	-	-	-	-	-	<0.00030	-
Mercury	<0.000020	<0.000020	0	-	-	-	<0.000020	<0.000020	0	-	-	-	-	-	<0.000020	-
Molybdenum	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	-	-	-	-	-	<0.0010	-
Nickel	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	-	-	-	-	-	<0.0010	-
Potassium	<2.0	<2.0	0	-	-	-	<2.0	<2.0	0	-	-	-	-	-	<2.0	-
Selenium	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	-	-	-	-	-	<0.0010	-
Silver	<0.000020	<0.000020	0	-	-	-	<0.000020	<0.000020	0	-	-	-	-	-	<0.000020	-
Sodium	<2.0	<2.0	0	-	-	-	<2.0	<2.0	0	-	-	-	-	-	<2.0	-
Thallium	<0.00020	<0.00020	0	-	-	-	<0.00020	<0.00020	0	-	-	-	-	-	<0.00020	-
Tin	<0.00050	<0.00050	0	-	-	-	<0.00050	<0.00050	0	-	-	-	-	-	<0.00050	-
Titanium	<0.010	<0.010	0	-	-	-	<0.010	<0.010	0	-	-	-	-	-	<0.010	-
Uranium	<0.00020	<0.00020	0	-	-	-	<0.00020	<0.00020	0	-	-	-	-	-	<0.00020	-
Vanadium	<0.0010	<0.0010	0	-	-	-	<0.0010	<0.0010	0	-	-	-	-	-	<0.0010	-
Zinc	<0.0050	0.0074	-39	-	-	-	<0.0050	<0.0050	0	-	-	-	-	-	<0.0050	-

Notes:

RPD = Relative Percent Difference (%) = ((original - duplicate) / (original + duplicate)/2) x 100.

Shaded RPDs exceed 25% (lab duplicates) or 50% (field duplicates).

Shaded travel and equipment blanks exceed laboratory method detection limits.

Table 2-9. Water chemistry results for East Dike Construction Monitoring, August and September 2008.

Basin		East Dike - Southeast										AEMP Location	East Dike - Northeast								East Basin			Outlet
Station		**SE2**			**SE3**			**E214**				**SP**	**NE1**		**NE2**	**NE3**	**A3**				**E203**	**SP2**	**SP3**	**E201**
Depth	**CCME (2007)**	interg.	interg.	1m	interg.	interg.	1m	2m	8m	2m	8m	4m	interg.	1m	interg.	interg.	2m	8m	2m	8m	2m	2m	2m	2m
Date	**Guideline**[1]	9-Aug-08	16-Aug-08	12-Sep-08	9-Aug-08	16-Aug-08	12-Sep-08	22-Aug-08	22-Aug-08	2-Sep-08	2-Sep-08	22-Aug-08	16-Aug-08	12-Sep-08	9-Aug-08	16-Aug-08	22-Aug-08	22-Aug-08	3-Sep-08	3-Sep-08	3-Sep-08	22-Aug-08	22-Aug-08	2-Sep-08
CONVENTIONAL PARAMETERS																								
Physical Tests																								
Conductivity (µS/cm)	NG	22.2	24.1	26.8	23.0	23.8	26.5	24.4	40.6	25.7	25.7	23.8	24.4	26.5	21.9	23.6	23.8	24.7	28.3	28.6	25.5	23.7	24.6	24.5
Hardness as $CaCO_3$ (mg/L)	NG	8.63	13.8	11.2	8.37	12.5	11.1	13.0	71.6	10.7	11.7	11.8	15.2	11.1	8.74	11.3	12.7	15.8	11.6	11.7	10.5	11.0	13.2	10.2
pH	6.5 - 9.0	8.14	7.27	7.27	7.82	7.24	7.29	7.28	7.64	7.26	7.28	7.24	7.28	7.26	6.46	7.24	7.29	7.32	7.34	7.33	7.29	7.29	7.31	7.27
Total Suspended Solids (mg/L)	NG	4.90	26.2	26.2	7.40	28.2	<3.0	17.2	378	11.2	10.7	10.7	40.7	-	3.90	20.7	13.2	21.2	15.2	12.7	8.20	10.7	23.7	6.20
Total Dissolved Solids (mg/L)	NG	13	29	17	15	31	17	20	95	27	25	21	24	22	<10	20	30	31	23	32	25	22	17	24
Anions & Nutrients (mg/L)																								
Alkalinity - Bicarbonate (as $CaCO_3$)	NG	6.1	6.6	8.5	6.8	6.5	8.3	7.8	-	7.4	7.3	6.6	7.0	8.0	7.4	6.9	7.5	7.6	8.2	8.6	7.6	6.5	7.6	6.6
Alkalinity - Carbonate (as $CaCO_3$)	NG	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity - Hydroxide (as $CaCO_3$)	NG	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity - Total (as $CaCO_3$)	NG	6.1	6.6	8.5	6.8	6.5	8.3	7.8	-	7.4	7.3	6.6	7.0	8.0	7.4	6.9	7.5	7.6	8.2	8.6	7.6	6.5	7.6	6.6
Ammonia (as N)[2]	8.24 @ pH7.0; 2.61 @ pH7.5; 0.83 @ pH8.0	0.020	0.031	<0.020	0.016	0.034	<0.020	<0.020	0.18	0.028	0.025	<0.020	0.036	0.028	0.033	0.039	0.046	0.028	0.026	0.029	0.021	0.070	0.031	<0.020
Chloride	NG	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	0.51	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	0.57	0.51	<0.50	<0.50	<0.50
Nitrate (as N)	2.9	0.0137	0.0242	0.0356	0.0166	0.0221	0.0350	0.0265	0.0794	0.0439	0.0420	0.0795	0.0381	0.0352	0.0120	0.0213	0.0233	0.0282	0.0623	0.0634	0.0269	0.0188	0.0280	0.0251
Nitrite (as N)	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	0.0056	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	0.0012	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	NG	-	0.150	0.0890	-	0.138	0.0890	0.0860	0.612	0.218	0.247	0.0930	0.133	0.0930	-	0.162	0.121	0.222	0.137	0.189	0.153	0.228	0.235	0.177
Ortho Phosphate (as P)	NG	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0013	<0.0010	0.0063	0.0011	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate (as P)	NG	0.00470	0.0370	0.00800	0.00740	0.528	0.00820	0.0340	0.400	0.0179	0.0182	0.0154	0.0450	0.00870	0.00400	0.0260	0.0260	0.0340	0.0208	0.0235	0.0148	0.0129	0.00280	0.0122
Silicate (as SiO_2)	NG	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sulfate (SO_4)	NG	1.93	2.23	2.05	1.82	2.22	2.05	2.26	2.42	2.17	2.13	2.49	2.20	2.09	1.97	2.20	2.24	2.25	2.27	2.28	2.34	2.25	2.18	2.26
ORGANIC / INORGANIC CARBON (mg/L)																								
Dissolved Organic Carbon	NG	1.79	2.06	1.74	1.75	2.04	1.80	1.63	1.44	1.96	4.00	1.75	2.19	1.84	1.92	1.88	1.52	1.55	1.73	2.12	1.86	-	-	2.12
Total Organic Carbon	NG	1.97	1.37	1.74	1.96	1.51	1.72	1.40	5.46	2.11	1.83	1.43	1.49	1.77	2.16	1.41	1.63	1.41	1.91	1.82	1.67	1.65	1.69	1.79
PLANT PIGMENTS																								
Chlorophyll a (µg/L)	NG	0.496	0.580	0.524	0.407	0.562	0.546	0.428	0.758	0.526	0.230	0.556	0.498	0.628	0.484	0.470	0.520	0.540	0.450	0.428	0.550	0.448	0.534	0.508
TOTAL METALS (mg/L)																								
Aluminum[3]	0.005 @pH<6.5 0.100 @ pH≥6.5	0.152	1.94	0.361	0.239	1.36	0.454	1.50	25.9	0.977	0.955	1.17	2.33	0.443	0.0871	0.976	1.37	2.82	1.18	0.994	0.589	0.688	1.63	0.701
Antimony	NG	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	0.00062	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	0.0050	<0.00050	0.00072	<0.00050	<0.00050	0.00071	<0.00050	0.00071	0.011	0.00054	0.00053	0.00054	0.0010	<0.00050	<0.00050	0.00051	0.00063	0.0012	0.00069	0.00061	<0.00050	<0.00050	0.00077	<0.00050
Barium	NG	<0.020	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.21	<0.020	<0.020	<0.020	0.022	<0.020	<0.020	<0.020	<0.020	0.027	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Beryllium	NG	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Boron	NG	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium[4]	0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	0.00017	<0.000017	<0.000017	<0.000017	0.000019	<0.000017	<0.000017	<0.000017	<0.000017	0.000020	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017
Calcium	NG	2.32	2.82	2.96	2.19	2.72	2.89	2.84	8.41	3.04	2.82	2.68	3.04	2.88	2.21	2.58	2.80	3.15	3.32	3.20	2.89	2.61	2.85	2.72
Chromium[5]	0.0010	<0.0010	0.0067	0.0011	<0.0010	0.0050	0.0014	0.0060	0.094	0.0034	0.0034	0.0039	0.0089	0.0014	<0.0010	0.0037	0.0053	0.010	0.0041	0.0034	0.0019	0.0023	0.0057	0.0022
Cobalt	NG	<0.00030	0.0011	<0.00030	<0.00030	0.00092	<0.00030	0.00094	0.014	0.00055	0.00056	0.00065	0.0014	<0.00030	<0.00030	0.00063	0.00079	0.0015	0.00070	0.00060	0.00034	0.00043	0.00095	0.00037
Copper*	0.0020	0.0016	0.0039	0.0018	0.0014	0.0038	0.0019	0.0039	0.041	0.0029	0.0029	0.0031	0.0053	0.0019	<0.0030	0.0030	0.0034	0.0055	0.0039	0.0032	0.0024	0.0021	0.0037	0.0023
Iron	0.30	0.166	2.47	0.457	0.289	1.90	0.552	1.81	30.2	1.12	1.07	1.31	2.82	0.558	0.118	1.29	1.60	3.01	1.35	1.13	0.669	0.892	1.88	0.785
Lead*	0.0010	<0.00050	0.0016	<0.00050	<0.00050	0.0015	<0.00050	0.0012	0.017	0.00080	0.00078	0.00087	0.0018	<0.00050	<0.00050	0.00090	0.0010	0.0018	0.0015	0.00093	0.00084	0.00066	0.0012	0.00059
Lithium	NG	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.041	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium	NG	0.790	1.64	0.960	0.800	1.39	1.00	1.44	12.3	1.27	1.20	1.24	1.85	1.01	0.760	1.19	1.38	1.94	1.40	1.28	1.06	1.08	1.47	1.07
Manganese	NG	0.00540	0.0438	0.00969	0.00842	0.0397	0.0106	0.0335	0.455	0.0215	0.0209	0.0242	0.0509	0.0101	0.00355	0.0249	0.0291	0.0501	0.0257	0.0227	0.0138	0.0179	0.0336	0.0138
Mercury	0.000026	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Molybdenum	0.073	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Nickel*	0.025	<0.0010	0.0042	0.0013	<0.0010	0.0035	0.0014	0.0037	0.056	0.0025	0.0025	0.0027	0.0056	0.0013	<0.0010	0.0030	0.0032	0.0059	0.0031	0.0026	0.0017	0.0018	0.0038	0.0018
Potassium	NG	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	9.7	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silver	0.00010	<0.000020	0.000021	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.00024	0.000023	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000028	<0.000020	<0.000020	<0.000020	<0.000020	0.000022	<0.000020
Sodium	NG	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	3.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Thallium	0.00080	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Tin	NG	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Titanium	NG	<0.010	0.10	0.016	0.012	0.074	0.020	0.078	1.2	0.042	0.039	0.049	0.11	0.020	<0.010	0.050	0.065	0.13	0.048	0.042	0.026	0.035	0.077	0.030
Uranium	NG	<0.00020	0.0011	0.00028	<0.00020	0.0010	0.00028	0.00076	0.011	0.00040	0.00039	0.00056	0.00099	0.00027	<0.00020	0.00052	0.00066	0.0011	0.00050	0.00046	0.00038	0.00044	0.00074	0.00037
Vanadium	NG	<0.0010	0.0035	<0.0010	<0.0010	0.0028	<0.0010	0.0026	0.040	0.0017	0.0016	0.0019	0.0041	<0.0010	<0.0010	0.0018	0.0023	0.0044	0.0020	0.0017	<0.0010	0.0013	0.0028	0.0011
Zinc	0.030	<0.0050	0.0081	<0.0050	<0.0050	0.0081	<0.0050	0.0063	0.079	0.0053	0.0065	0.0050	0.0090	<0.0050	<0.0050	0.0061	0.0060	0.0084	0.0077	0.0076	0.0057	<0.0050	0.0063	<0.0050

Table 2-9 con't. Water chemistry results for East Dike Construction Monitoring, August and September 2008.

Basin		East Dike - Southeast										AEMP Location	East Dike - Northeast								East Basin			Outlet
Station		SE2			SE3			E214				SP	NE1		NE2	NE3	A3				E203	SP2	SP3	E201
Depth	CCME (2007)	interg.	interg.	1m	interg.	interg.	1m	2m	8m	2m	8m	4m	interg.	1m	interg.	interg.	2m	8m	2m	8m	2m	2m	2m	2m
Date	Guideline[1]	9-Aug-08	16-Aug-08	12-Sep-08	9-Aug-08	16-Aug-08	12-Sep-08	22-Aug-08	22-Aug-08	2-Sep-08	2-Sep-08	22-Aug-08	16-Aug-08	12-Sep-08	9-Aug-08	16-Aug-08	22-Aug-08	22-Aug-08	3-Sep-08	3-Sep-08	3-Sep-08	22-Aug-08	22-Aug-08	2-Sep-08
DISSOLVED METALS (mg/L)[6]																								
Aluminum[3]	0.005 @pH<6.5 0.100 @ pH≥6.5	0.0295	0.0979	0.0541	0.0512	0.152	0.0589	0.00680	0.0199	0.0345	0.0289	0.0121	0.204	0.0515	0.0169	0.112	0.00970	<0.0050	0.0465	0.0751	0.0160	0.0337	0.0354	0.0179
Antimony	NG	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00065	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Barium	NG	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Beryllium	NG	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Boron	NG	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium[4]	0.000004	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017
Calcium	NG	2.25	2.59	3.00	2.17	2.60	3.00	2.85	5.70	2.95	3.24	2.59	2.78	2.95	2.28	2.51	2.67	2.90	3.24	3.26	2.85	2.56	2.72	2.76
Chromium[5]	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cobalt	NG	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Copper*	0.0020	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron	0.30	0.032	0.15	0.045	0.055	0.25	0.050	<0.030	<0.030	<0.030	<0.030	<0.030	0.34	0.047	<0.030	0.15	<0.030	<0.030	0.035	0.057	<0.030	0.031	0.031	<0.030
Lead*	0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lithium	NG	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium	NG	0.73	0.80	0.90	0.72	0.86	0.88	0.78	1.1	0.81	0.87	0.79	0.88	0.91	0.74	0.86	0.78	0.81	0.85	0.86	0.83	0.79	0.77	0.81
Manganese	NG	0.00244	0.00900	0.00123	0.00349	0.0101	0.00135	0.00335	0.0123	0.00417	0.00378	0.00158	0.0133	0.00111	0.00162	0.00654	0.00242	0.00527	0.00393	0.00435	0.00106	0.00152	0.00375	0.00123
Mercury	0.000026	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Molybdenum	0.073	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Nickel*	0.025	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Potassium	NG	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silver	0.00010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Sodium	NG	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.2	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Thallium	0.00080	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Tin	NG	<0.00050	<0.00050	<0.00050	<0.00050	0.00434	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0027	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Titanium	NG	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	NG	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0014	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Vanadium	NG	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc	0.030	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0081	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Notes:

NG = no guideline.

[1]CCME (Canadian Council of Ministers of the Environment) Canadian Water Quality Guidelines for the Protection of Aquatic Life, 1999, updated December 2007.

[2]Ammonia guidelines are for 10°C.

[3]Aluminum guideline is pH dependent.

[4]Interim cadmium guideline.

[5]Chromium guideline is for Cr VI, which yields the most conservative guideline.

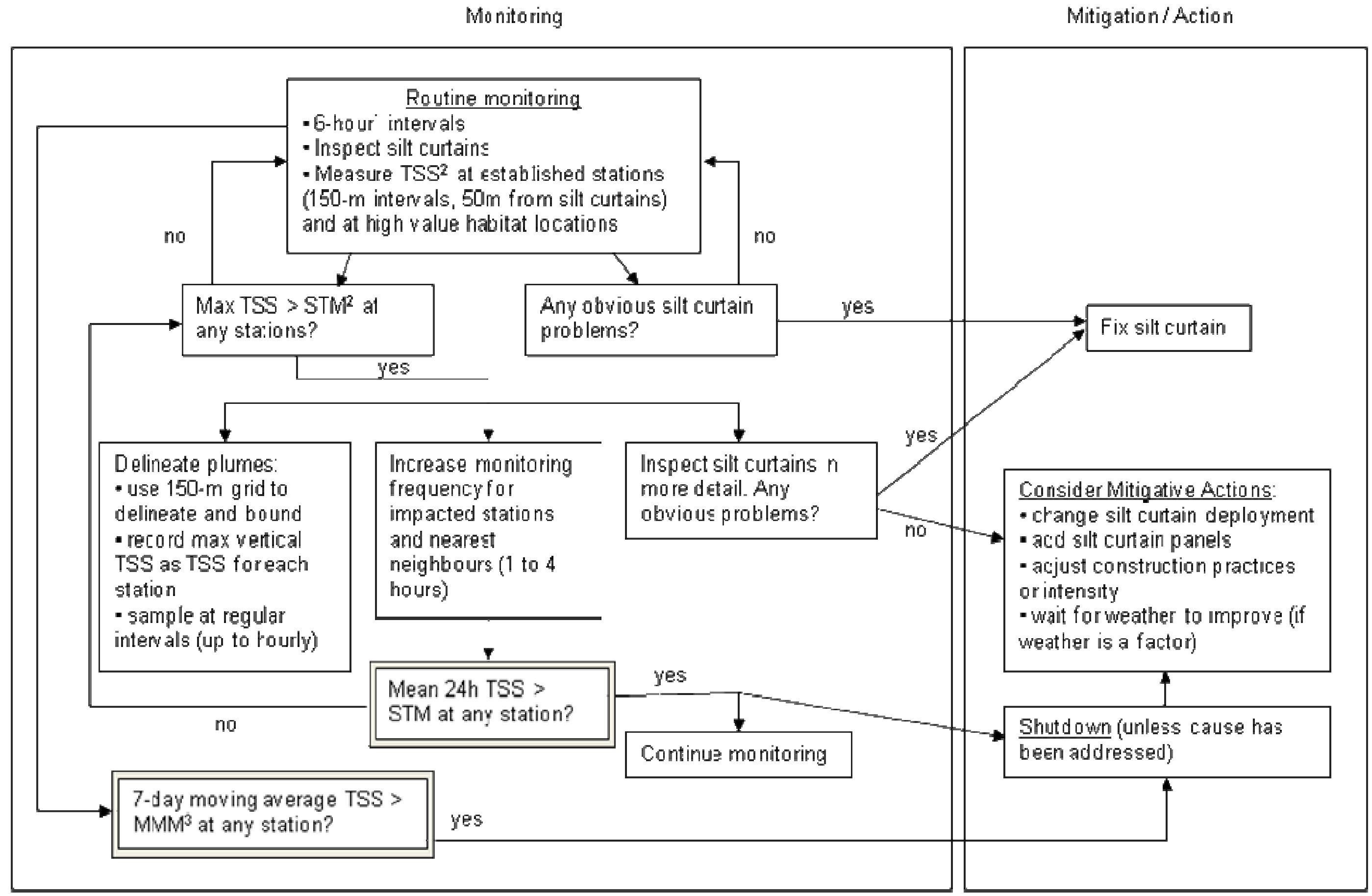
[6]Guidelines have not yet been made for "Dissolved Metals," thus were screened against CCME guidelines for "Total Metals."

*Copper, lead and nickel guidelines are hardness dependent; minimum hardness was selected to yield the most conservative guideline.

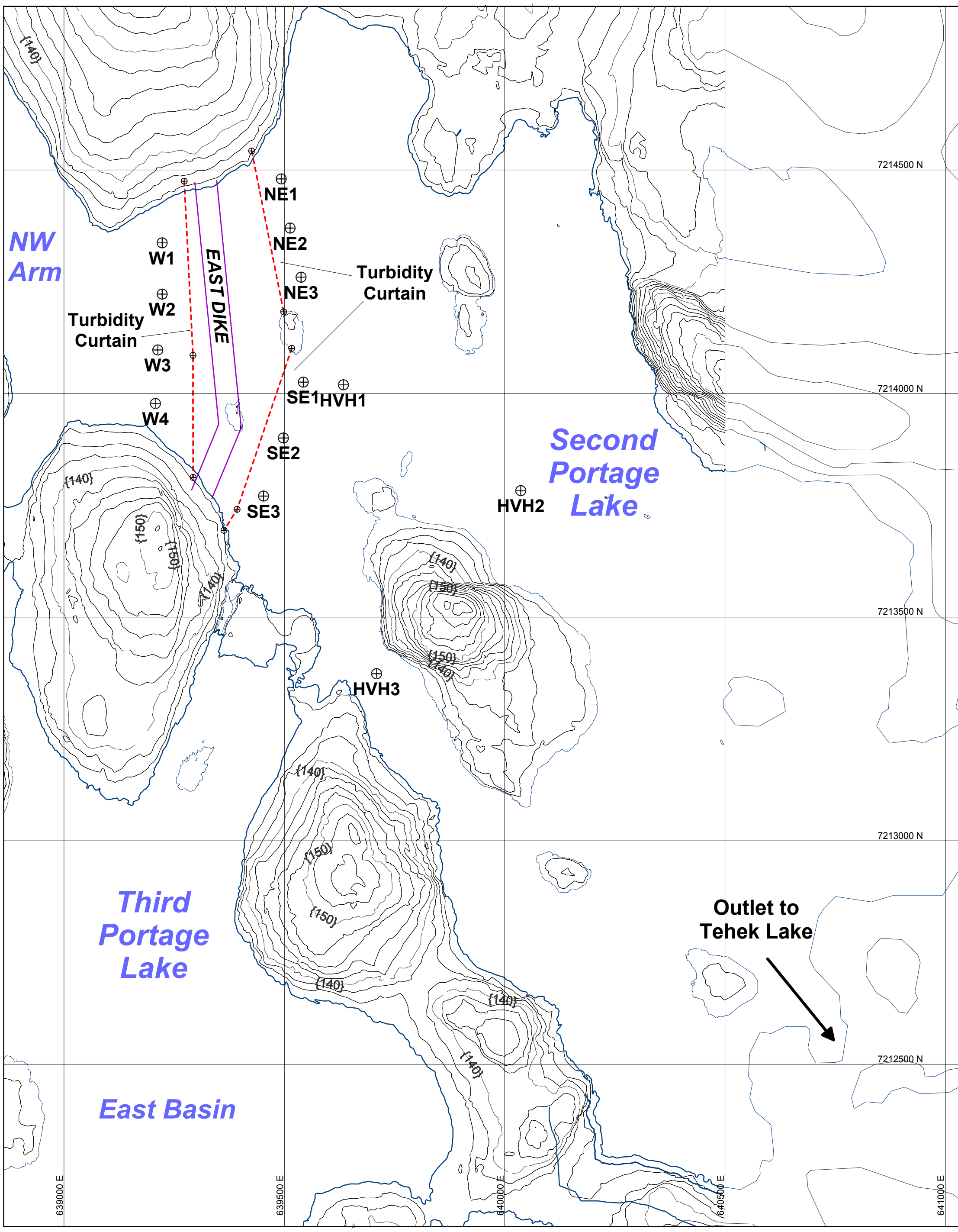
Shaded concentrations exceed the CCME guideline.

interg. = intergrated water sample throughout the water column.

Figure 2-1. Framework for TSS Monitoring and Management during dike construction (from AEM, 2008a).



Notes: 1. During daylight hours and/or weather/logistics permitting. 2. TSS will be measured using turbidity as a surrogate once a relationship is established. 3. STM = short term maximum concentration of TSS. MMM = maximum monthly mean TSS concentration.



Legend

Monitoring Location

W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations

Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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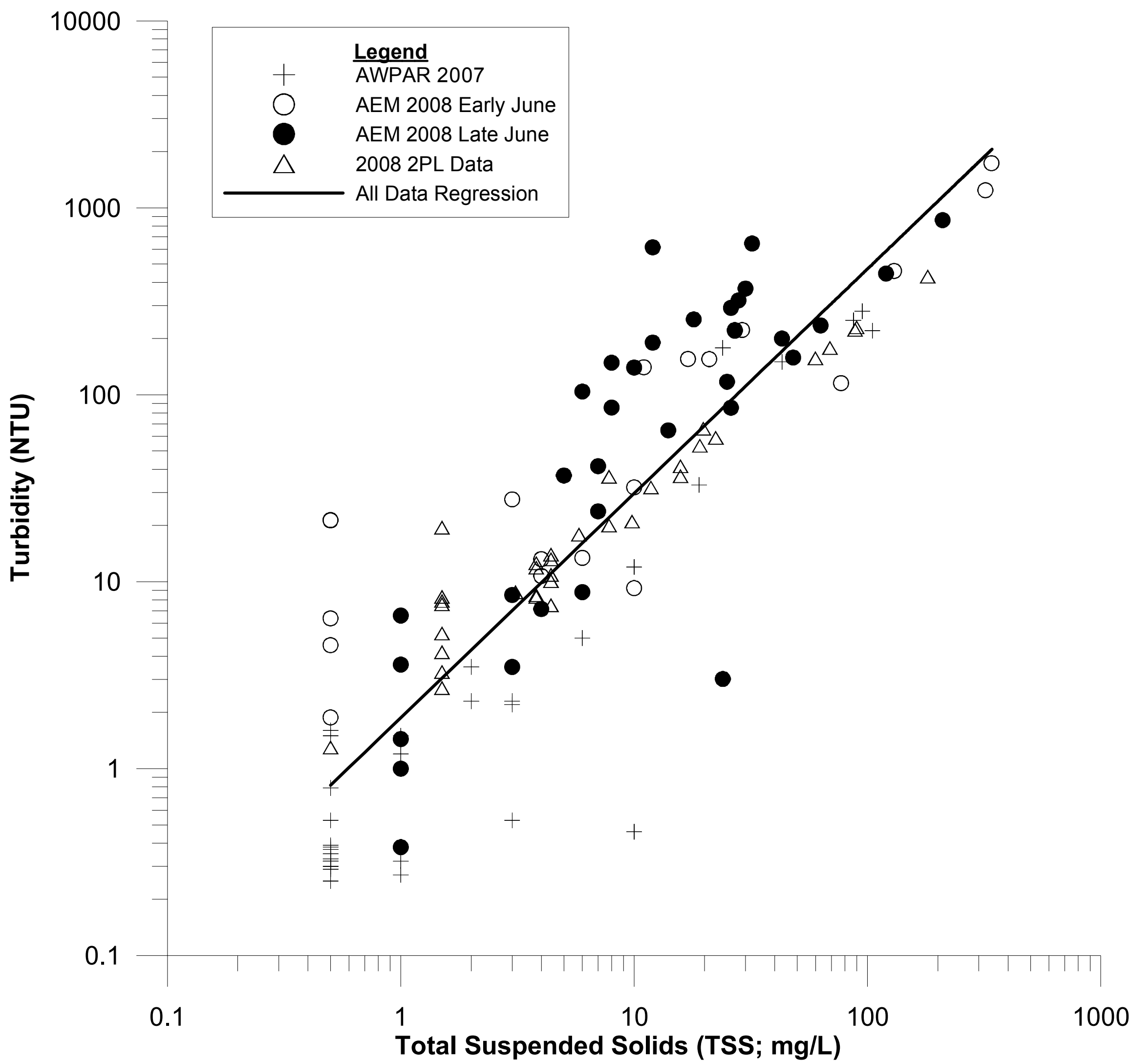
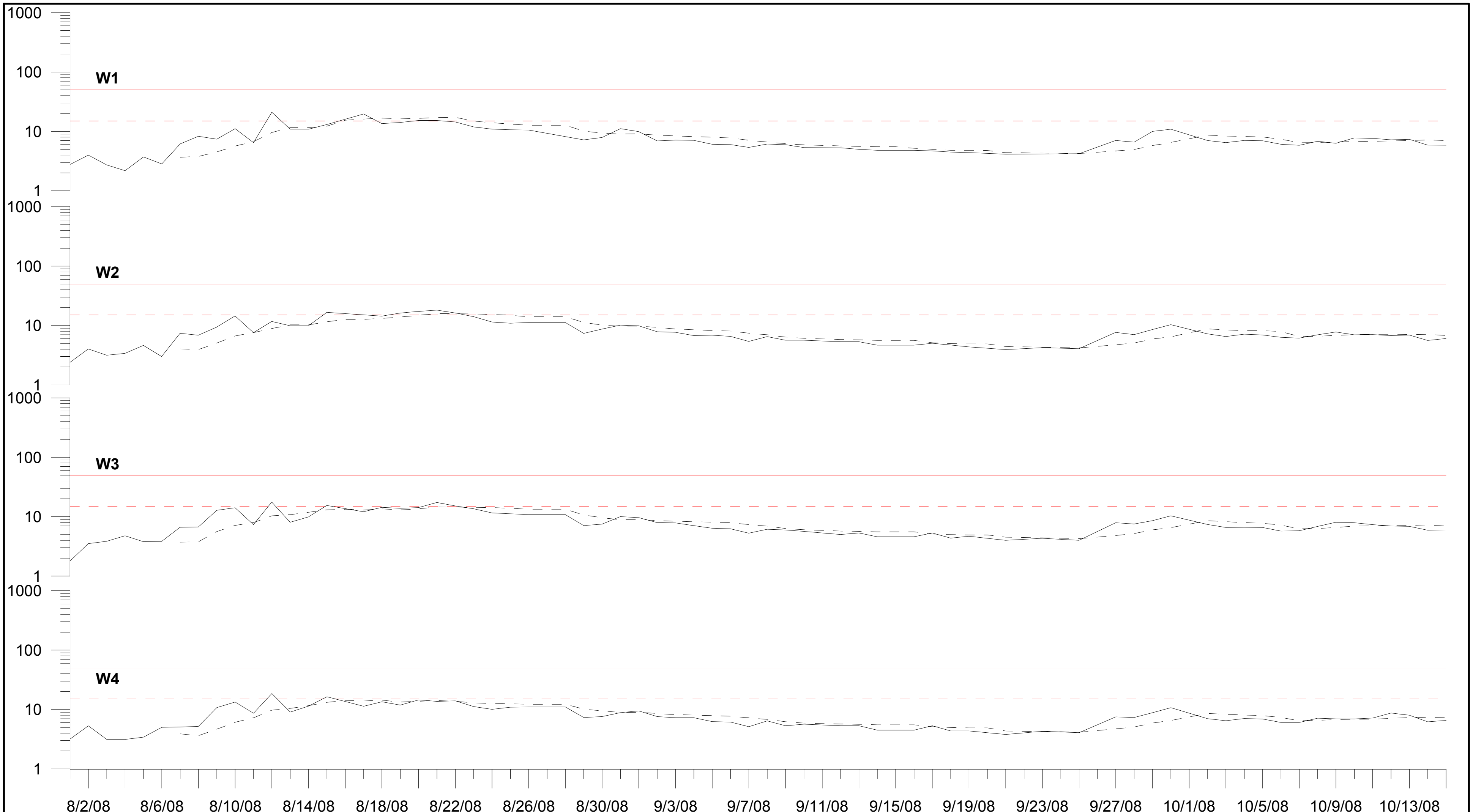
EAST DIKE CONSTRUCTION ZONE, TURBIDITY BARRIERS AND ROUTINE MONITORING STATION LOCATIONS

FIGURE 2-2

SE 2PL TSS.GRF

Figure 2-3. Final TSS-turbidity relationship showing all data sources.





Legend

- 24-hr Trigger
- 7-day Trigger
- 24-hr Ave TSS
- 7-day Ave TSS

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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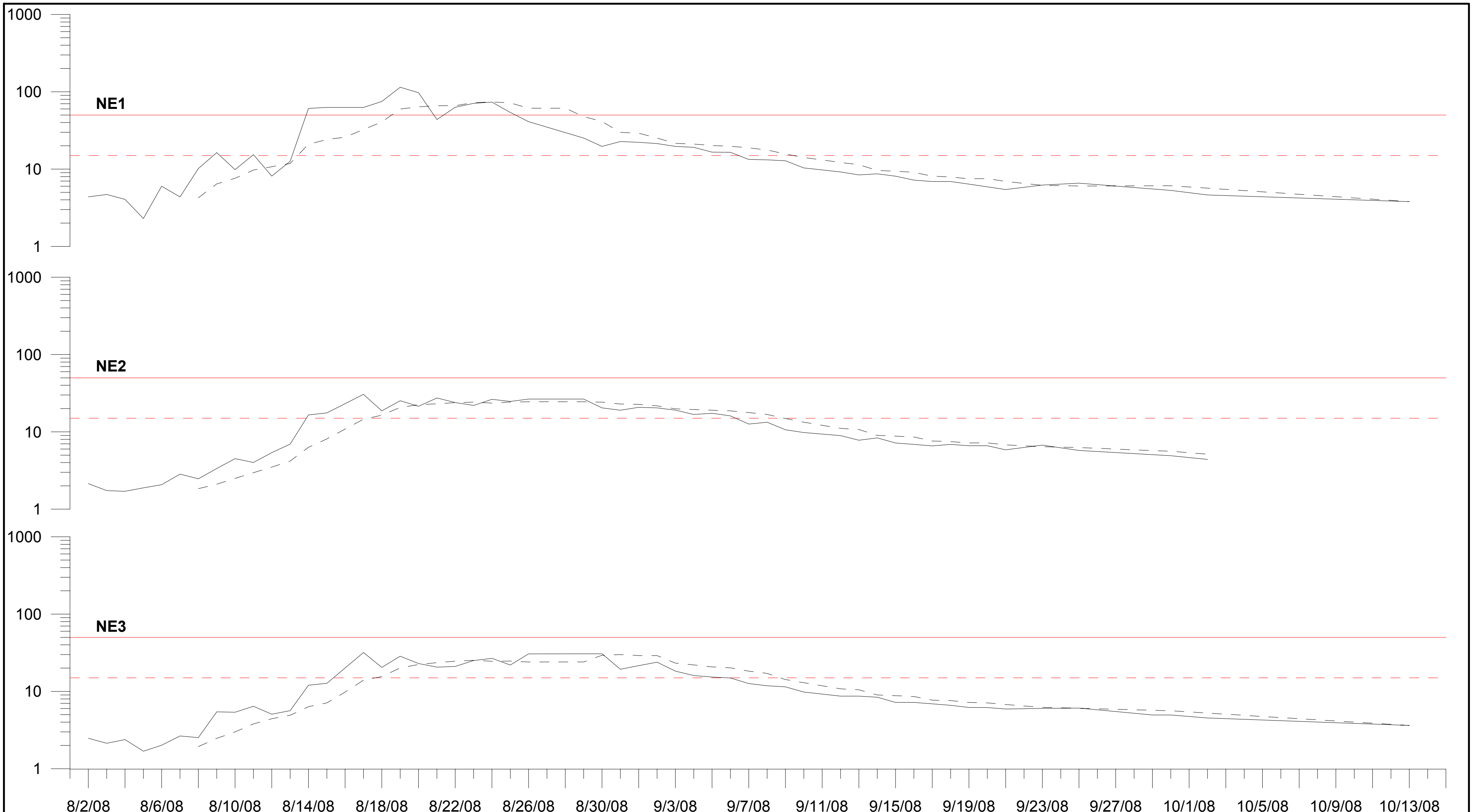
TSS (mg/L) MONITORING RESULTS FOR WEST STATIONS

FIGURE 2-4

Routine Stn Time Series.GRF



Legend

- 24-hr Trigger
- 7-day Trigger
- 24-hr Ave TSS
- 7-day Ave TSS

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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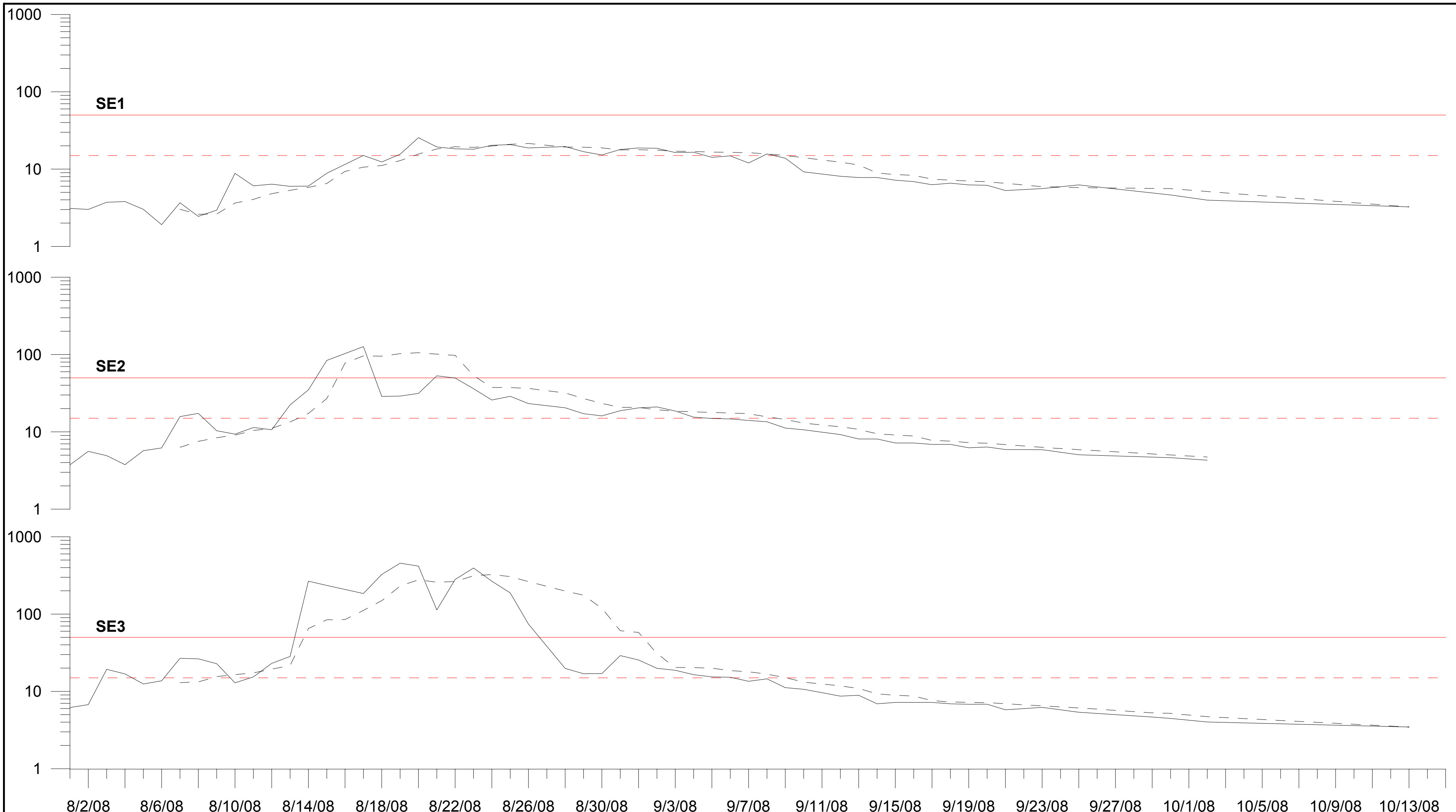
TSS (mg/L) MONITORING RESULTS FOR
NORTHEAST STATIONS

FIGURE 2-5

Routine Stn Time Series.GRF



Legend

- 24-hr Trigger
- 7-day Trigger
- 24-hr Ave TSS
- 7-day Ave TSS

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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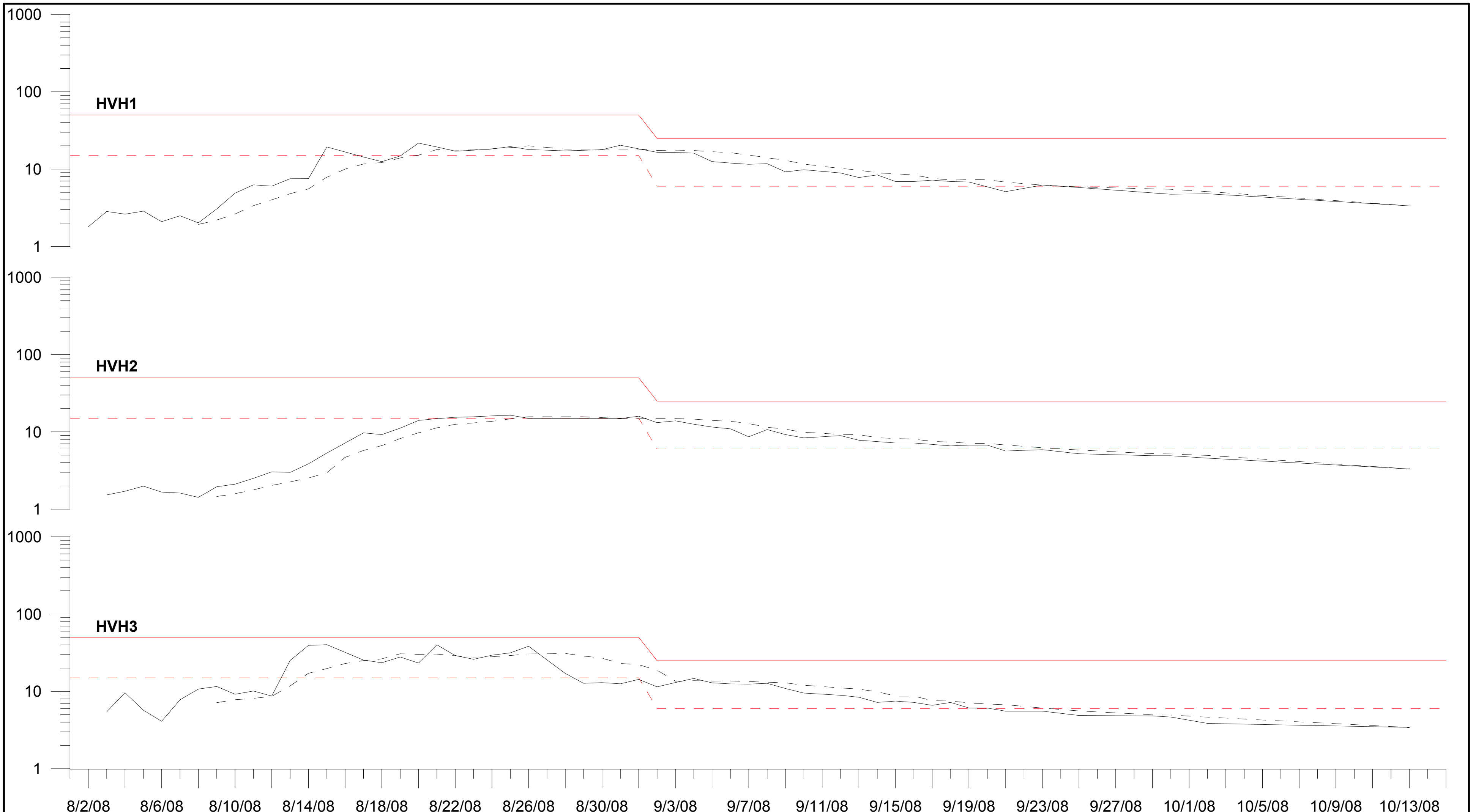
TSS (mg/L) MONITORING RESULTS FOR SOUTHEAST STATIONS

FIGURE 2-6

Routine Stn Time Series.GRF



Legend

- 24-hr Trigger
- 7-day Trigger
- 24-hr Ave TSS
- 7-day Ave TSS

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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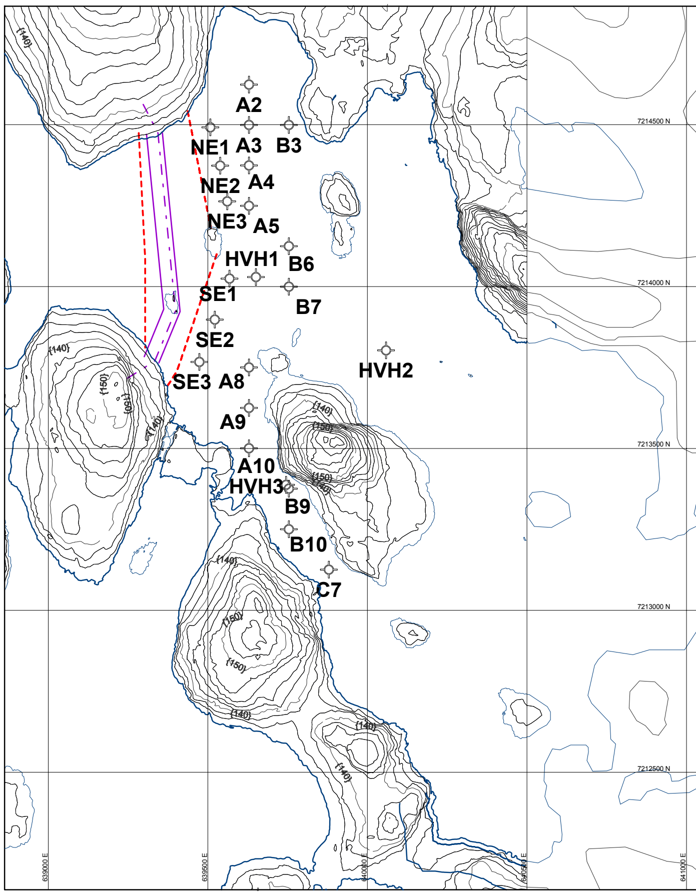
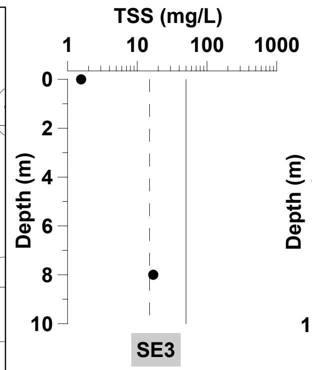
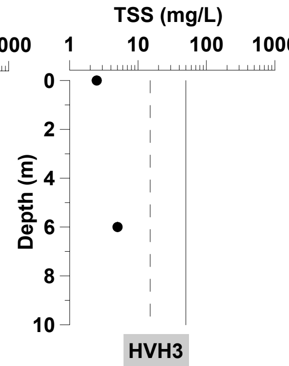
TSS (mg/L) MONITORING RESULTS FOR
HIGH-VALUE HABITAT STATIONS

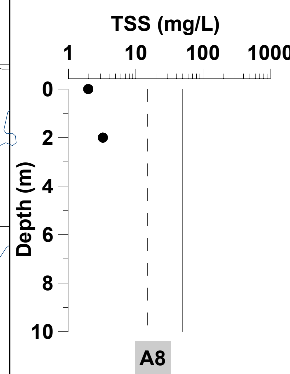
FIGURE 2-7

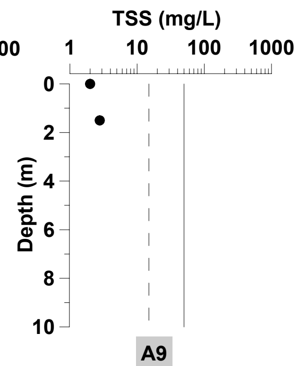
Routine Stn Time Series.GRF











Legend

⌖ Monitoring Location

W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations
A, B, C = added in turbidity surveys

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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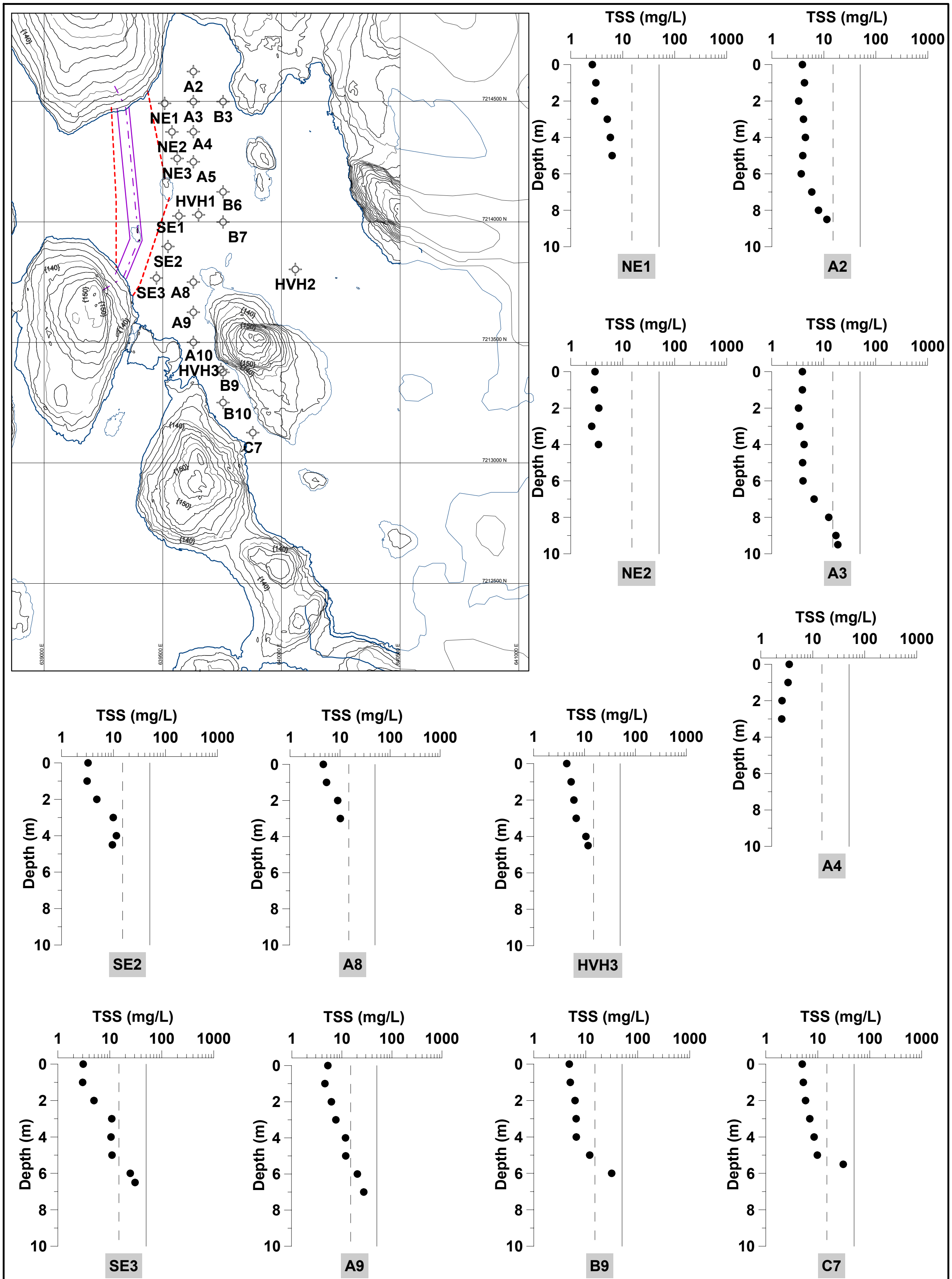
TSS (mg/L) PROFILES FOR KEY SURVEY STATIONS - AUGUST 3

FIGURE 2-8

TSS PROFILING.GRF



Legend	TSS Trigger Values (mg/L)		
Monitoring Location	Station	24-hr Ave	7-d Ave
W*n*, NE*n*, SE*n* = Routine Stations	Routine	50	15
HVH*n* = High Value Habitat Stations	HVH_a	50	15
A, B, C = added in turbidity surveys	HVH_b	25	6
	a = prior to Sept 1		
	b = after Sept 1		

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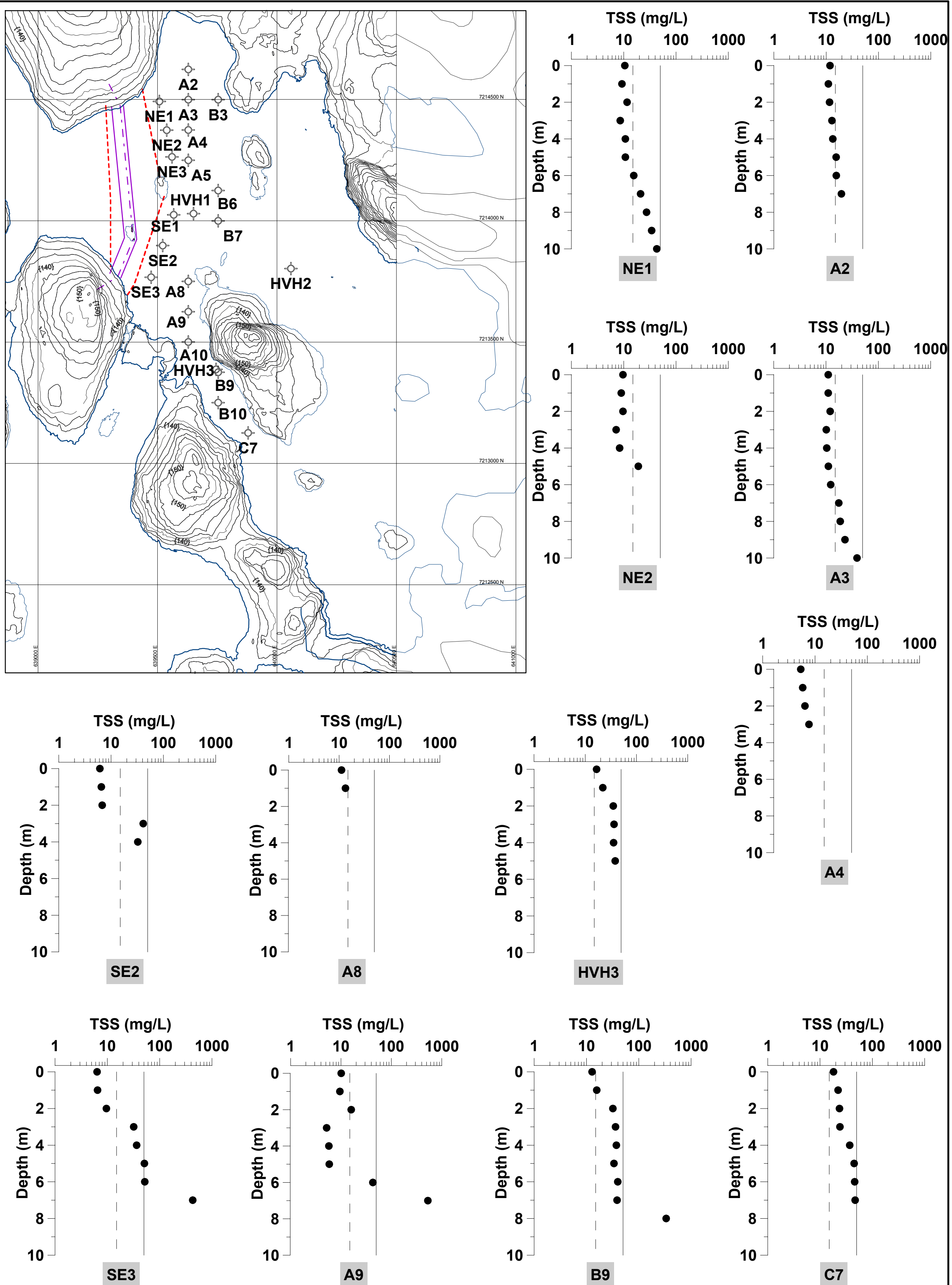
TSS (mg/L) PROFILES FOR KEY SURVEY STATIONS - AUGUST 8

FIGURE 2-9

TSS PROFILING.GRF



Legend
Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations HVH*n* = High Value Habitat Stations A, B, C = added in turbidity surveys

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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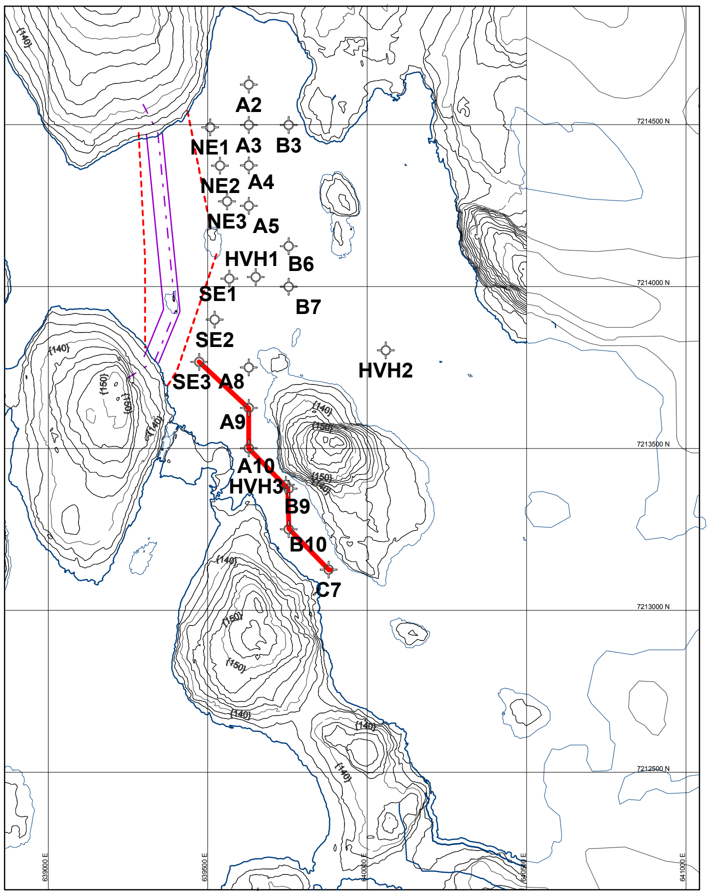
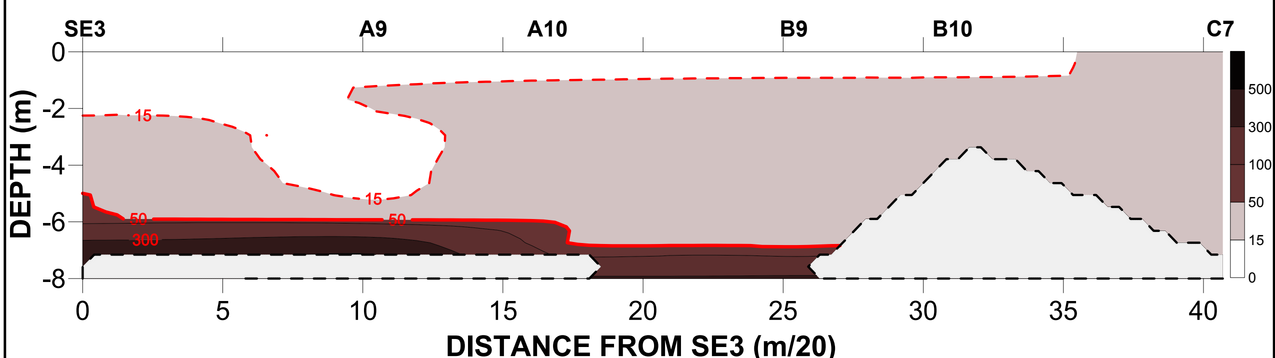
TSS (mg/L) PROFILES FOR KEY SURVEY STATIONS - AUGUST 13

FIGURE 2-10a

TSS PROFILING.GRF





Legend	TSS Trigger Values (mg/L)
Monitoring Location	

Wn, NEn, SEn = Routine Stations
HVHn = High Value Habitat Stations
A, B, C = added in turbidity surveys

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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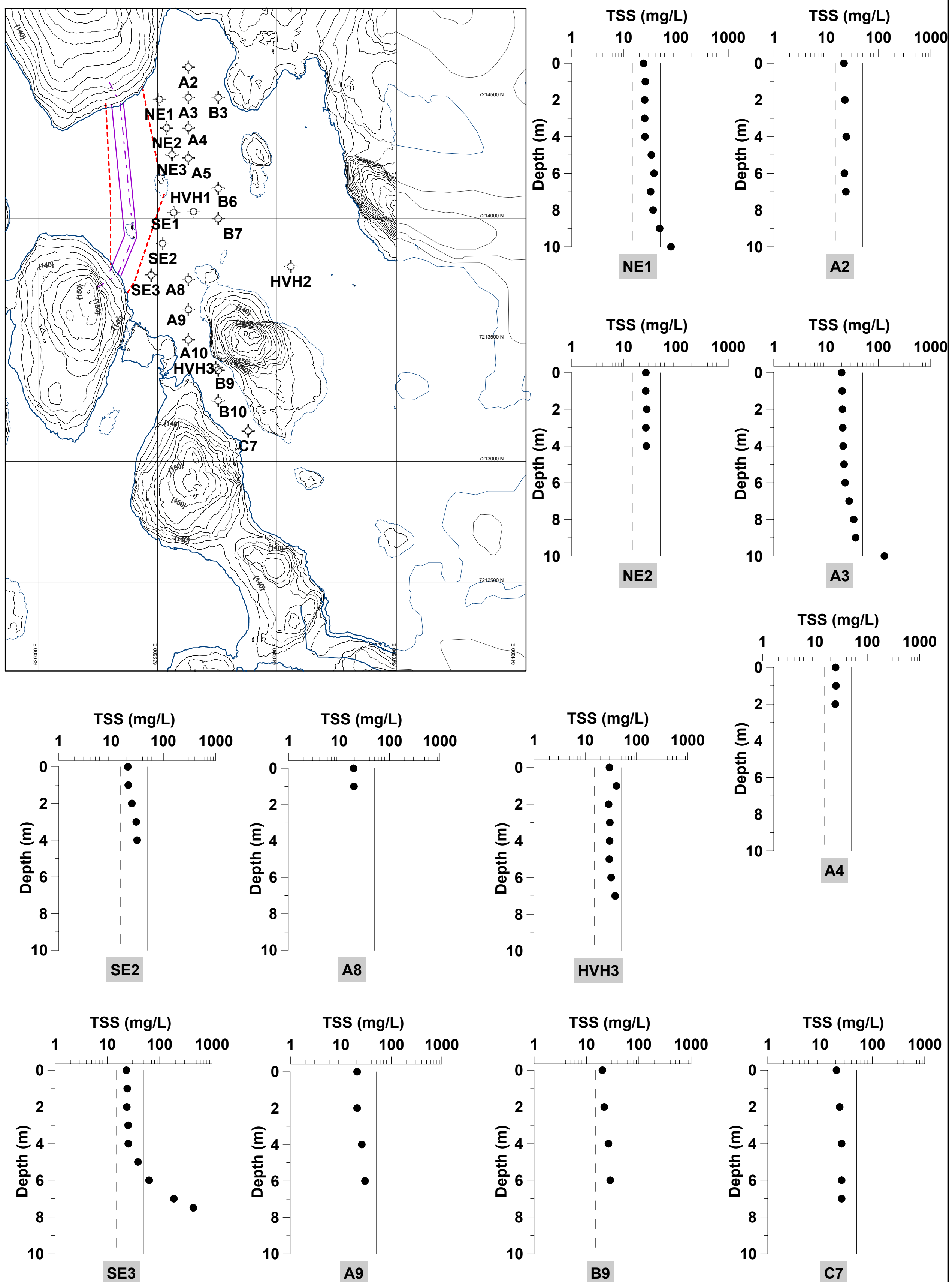
CROSS-SECTION THROUGH SE3 TSS PLUME - AUGUST 13

FIGURE 2-10b

TSS PROFILING.GRF



Legend	TSS Trigger Values (mg/L)

Monitoring Location

W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations
A, B, C = added in turbidity surveys

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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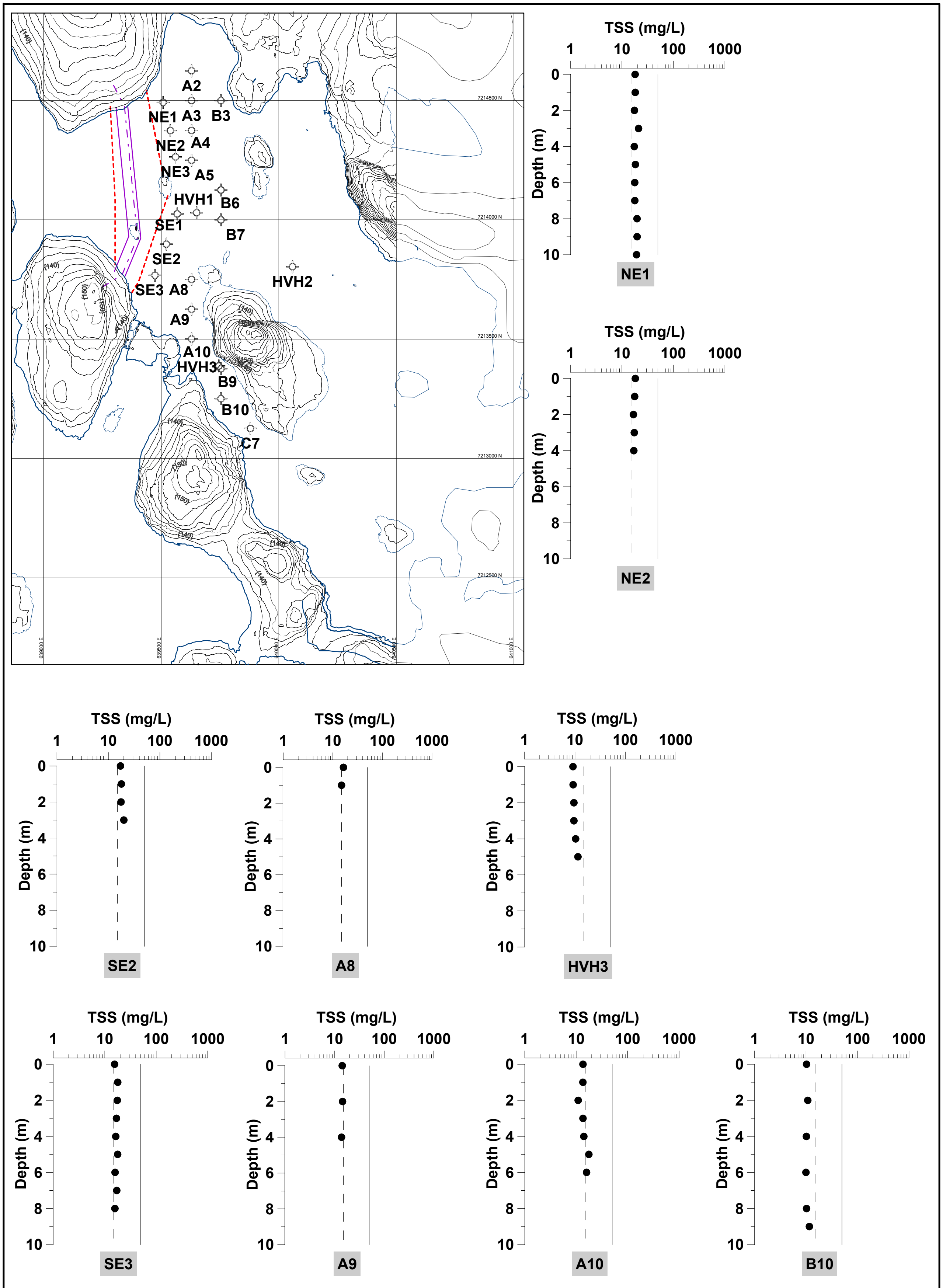
TSS (mg/L) PROFILES FOR KEY SURVEY STATIONS - AUGUST 22

FIGURE 2-11

TSS PROFILING.GRF



Legend	TSS Trigger Values (mg/L)		
Monitoring Location	**Station**	**24-hr Ave**	**7-d Ave**
W*n*, NE*n*, SE*n* = Routine Stations	Routine	50	15
HVH*n* = High Value Habitat Stations	HVH_a	50	15
A, B, C = added in turbidity surveys	HVH_b	25	6
	a = prior to Sept 1		
	b = after Sept 1		

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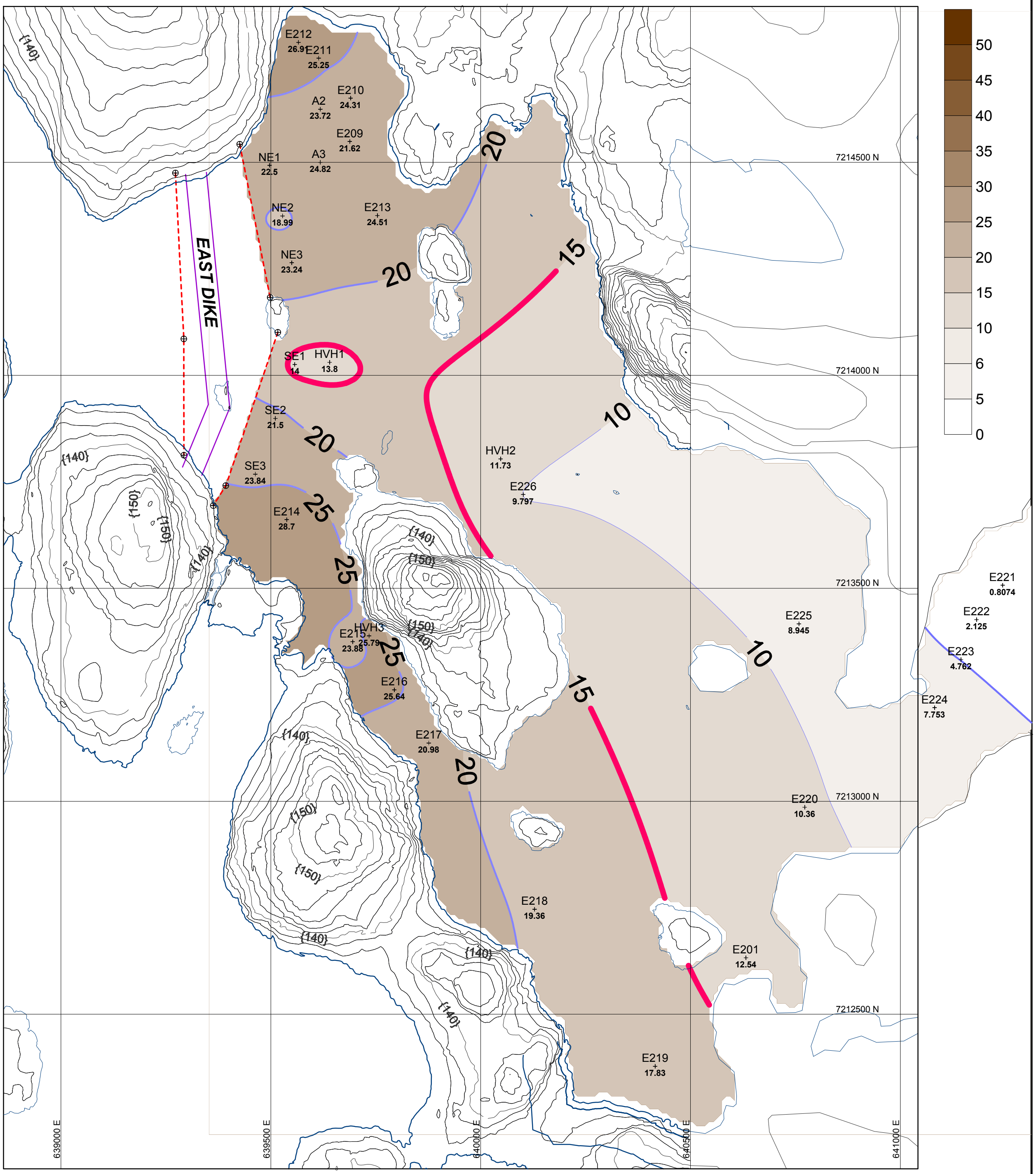
TSS (mg/L) PROFILES FOR KEY SURVEY STATIONS - SEPTEMBER 1

FIGURE 2-12

TSS PROFILING.GRF



Legend
Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations
Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1

b = after Sept 1

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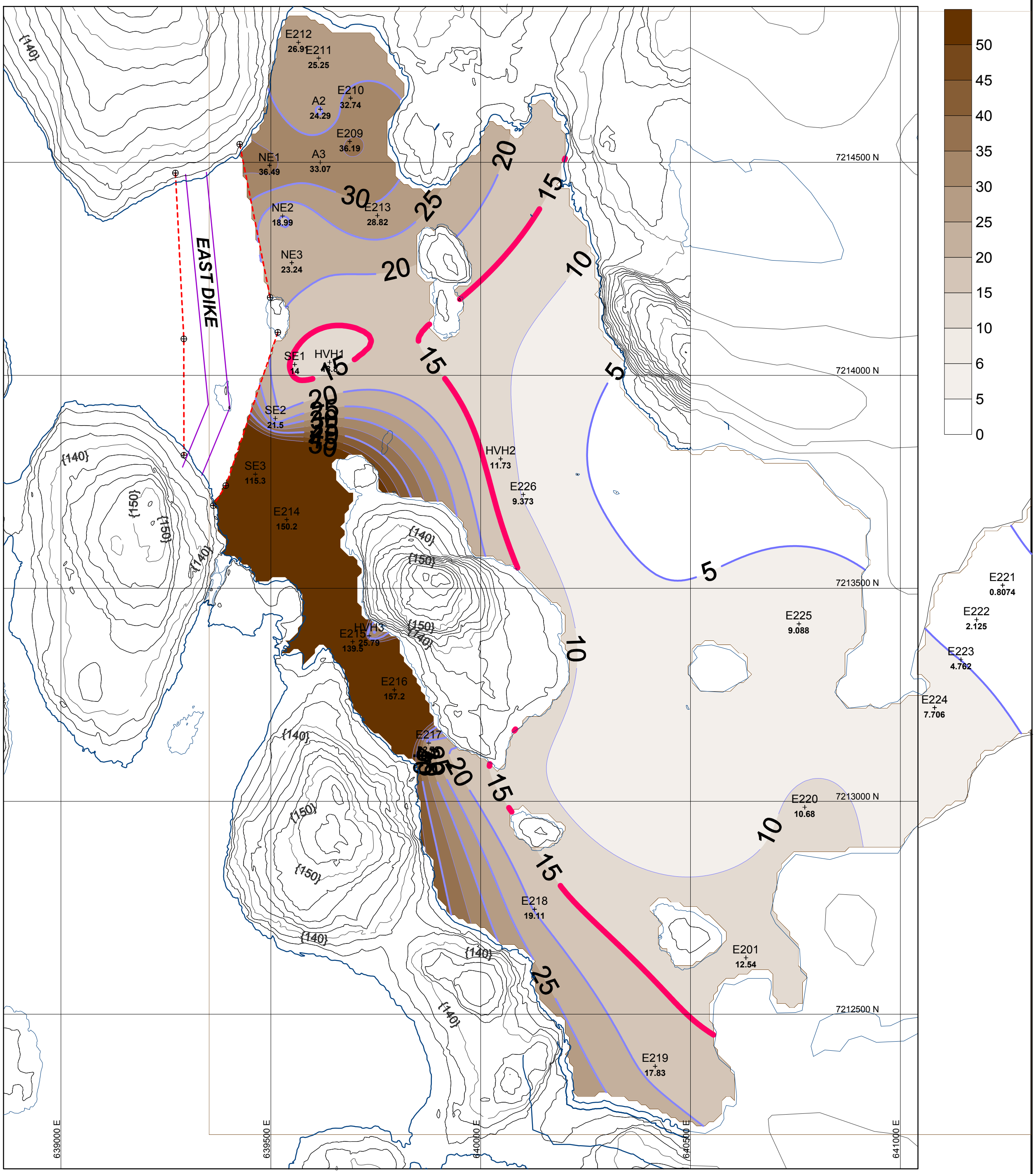
SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN 0-5m) - AUGUST 18

FIGURE 2-13

SE 2PL TSS.GRF



Legend
Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations
Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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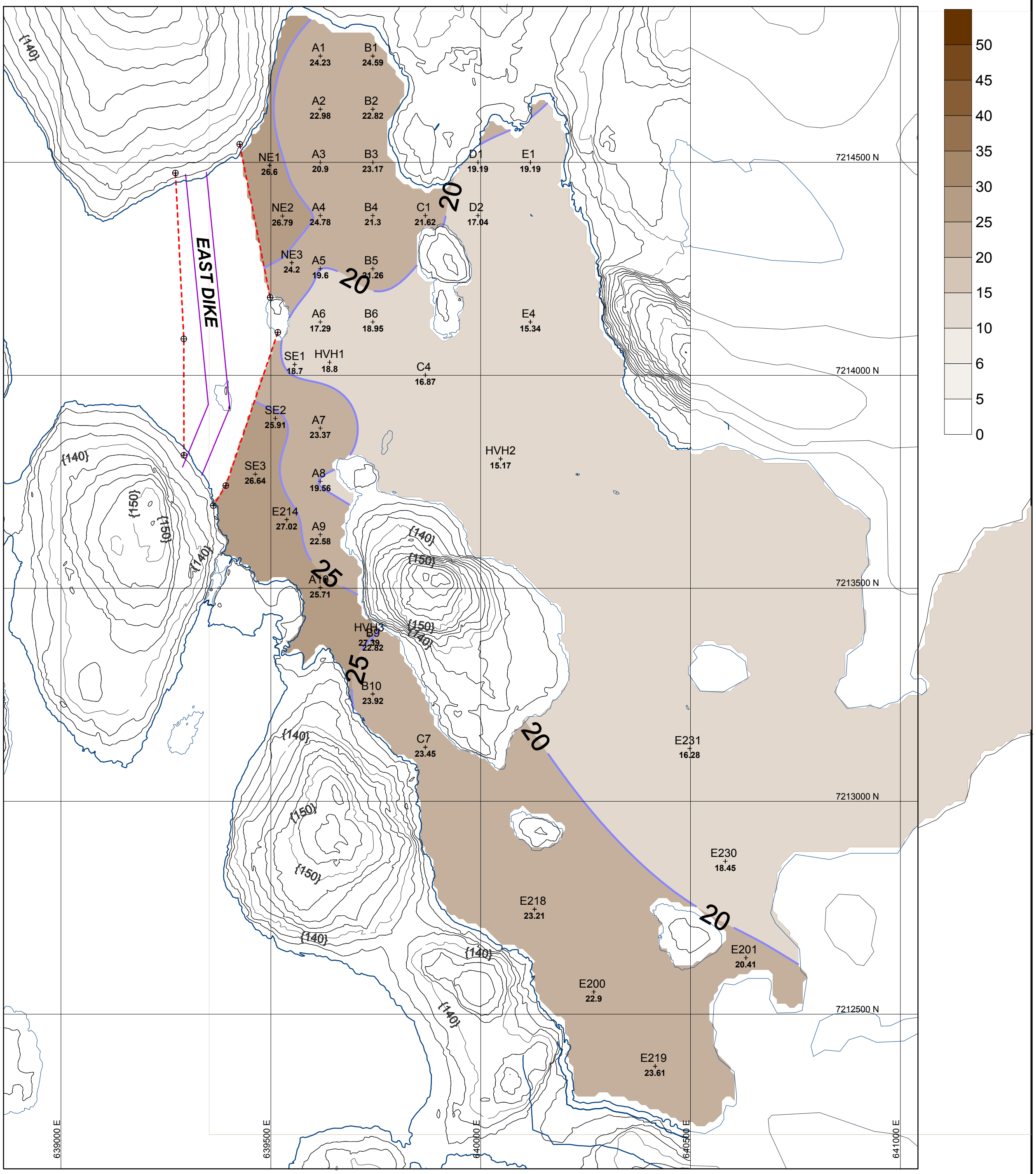
SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN ALL DEPTHS) - AUGUST 18

FIGURE 2-14

SE 2PL TSS.GRF



Legend
Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations
Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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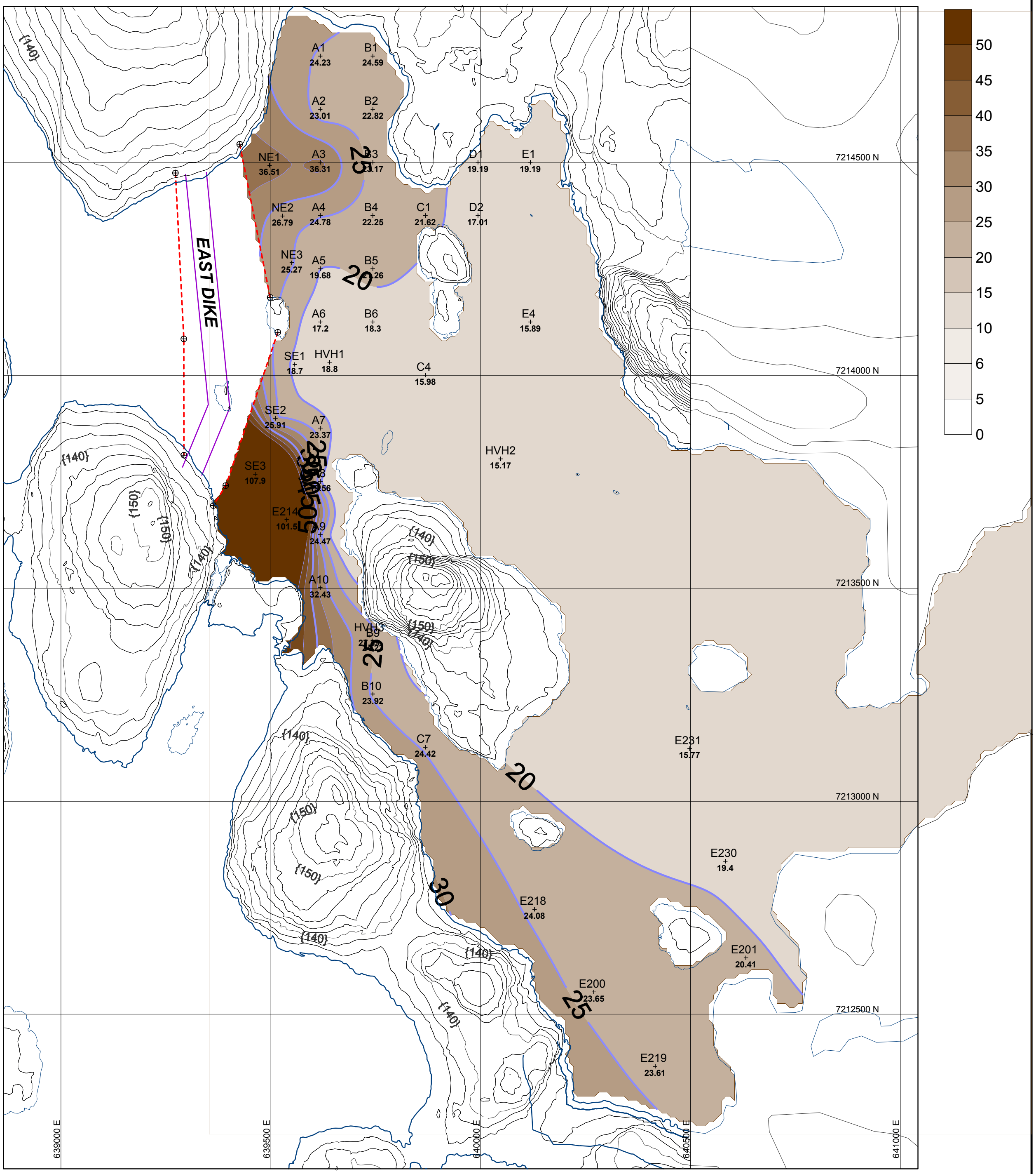
EAST DIKE CONSTRUCTION MONITORING 2008

SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN 0-5m) - AUGUST 22

FIGURE 2-15

SE 2PL TSS.GRF



Legend
⌖ Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations HVH*n* = High Value Habitat Stations
Green symbols = reference areas Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1

b = after Sept 1

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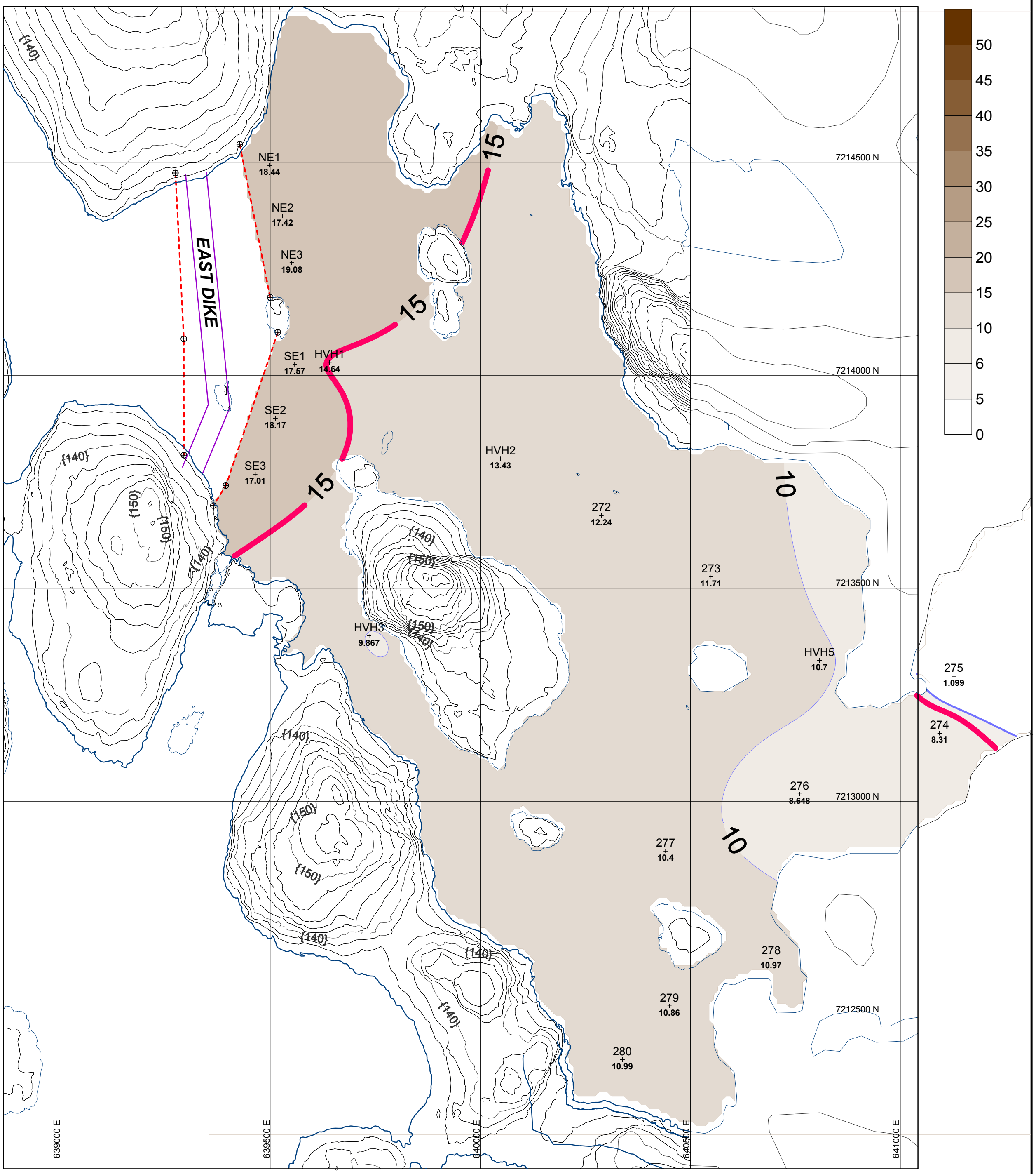
EAST DIKE CONSTRUCTION MONITORING 2008

SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN ALL DEPTHS) - AUGUST 22

FIGURE 2-16

SE 2PL TSS.GRF



Legend
Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations
Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1

b = after Sept 1

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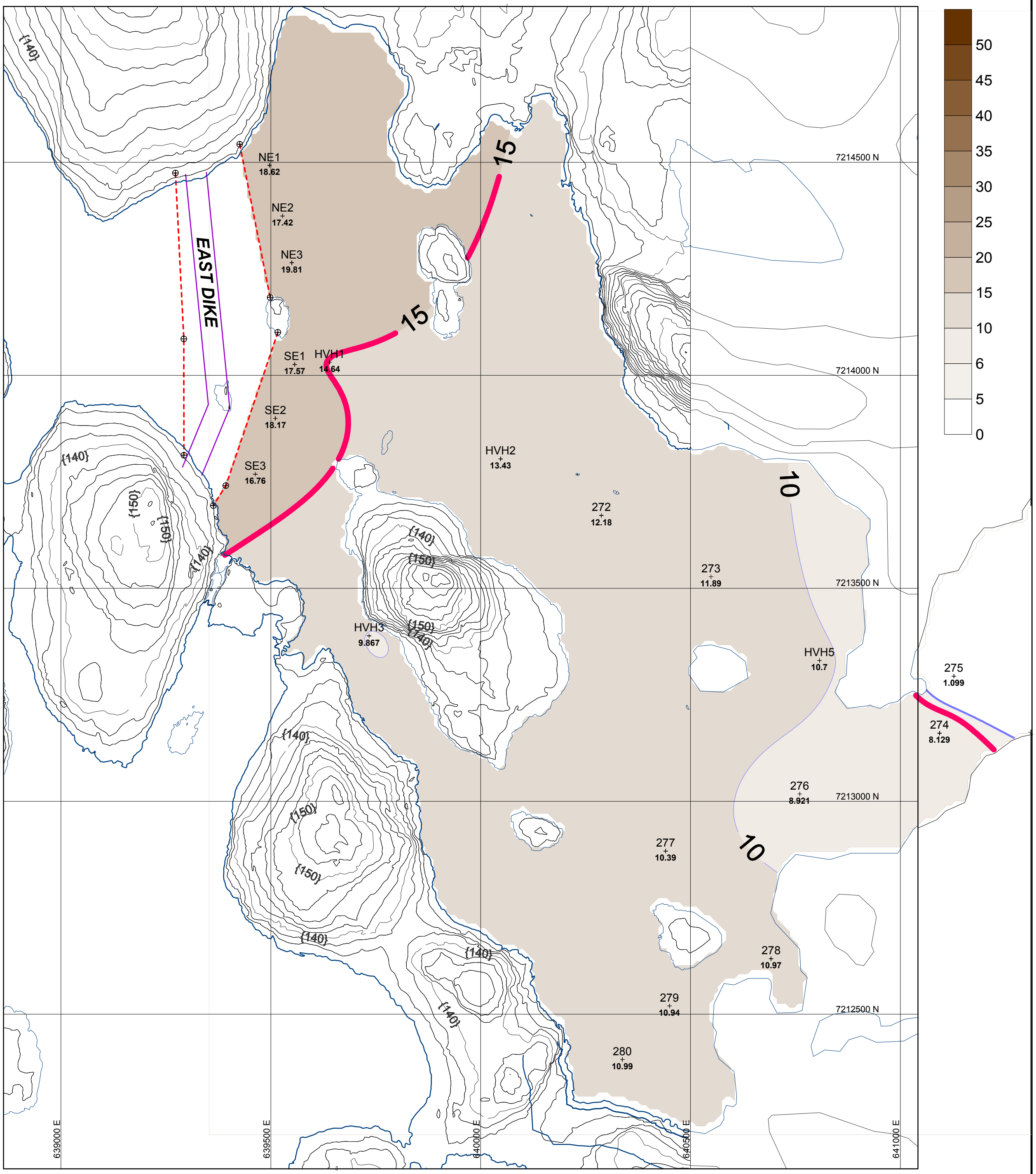
EAST DIKE CONSTRUCTION MONITORING 2008

SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN 0-5m) - SEPT 1

FIGURE 2-17

SE 2PL TSS.GRF



Legend
Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations HVH*n* = High Value Habitat Stations
Green symbols = reference areas Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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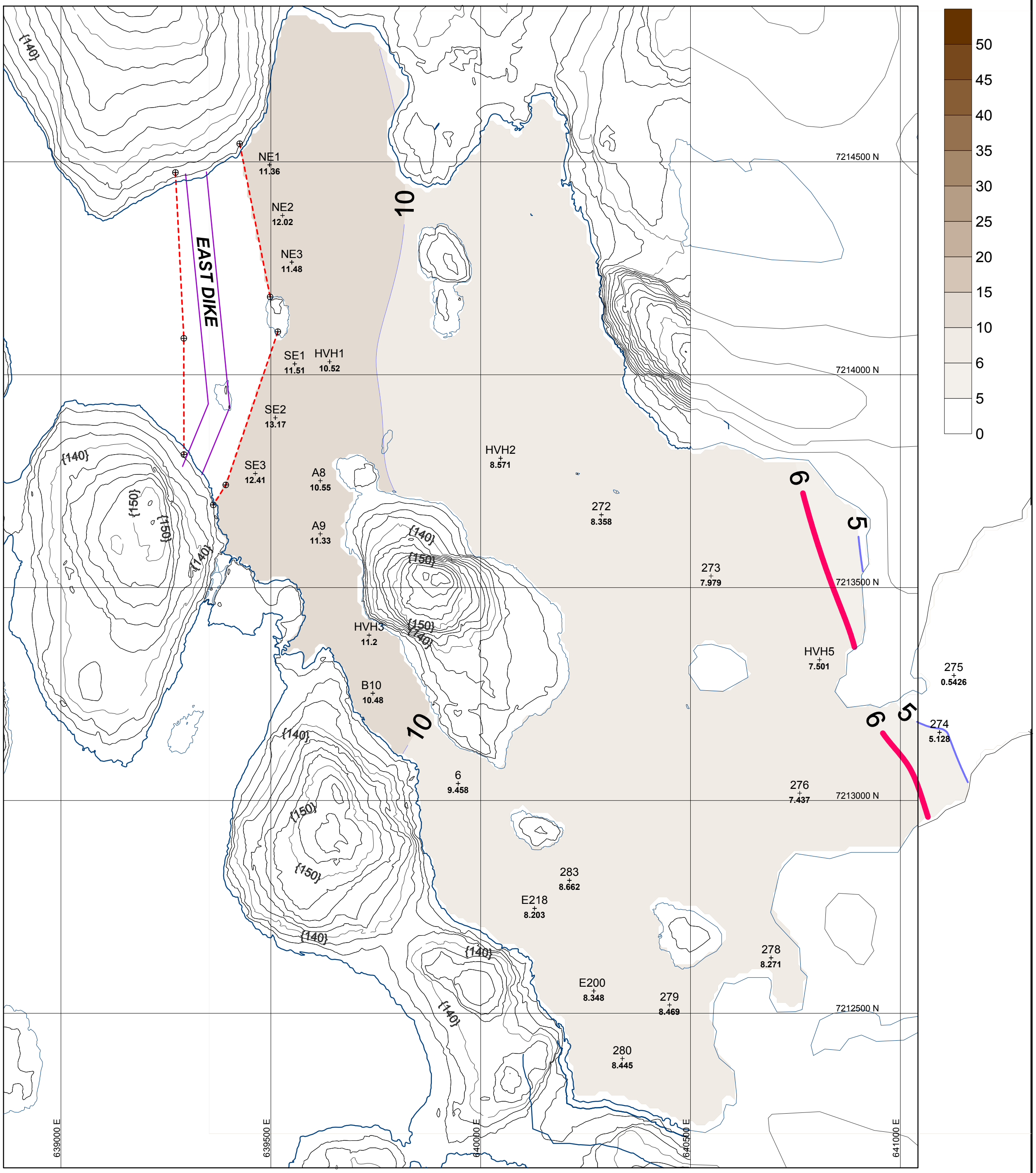
EAST DIKE CONSTRUCTION MONITORING 2008

SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN ALL DEPTHS) - SEPT 1

FIGURE 2-18

SE 2PL TSS.GRF



Legend

Monitoring Location

W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations

Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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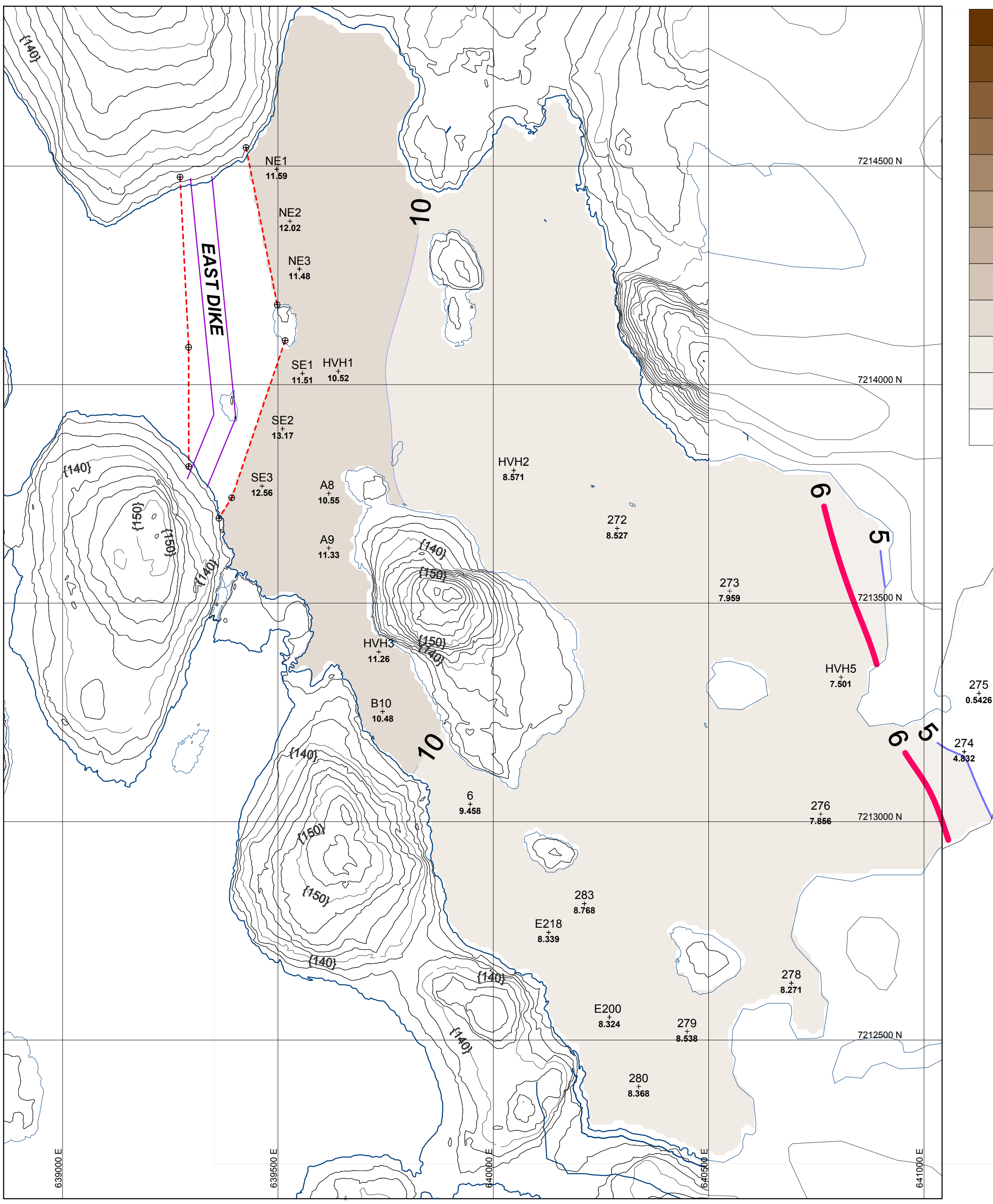
SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN 0-5m) - SEPT 6

FIGURE 2-19

SE 2PL TSS.GRF



Legend

Monitoring Location

W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations

Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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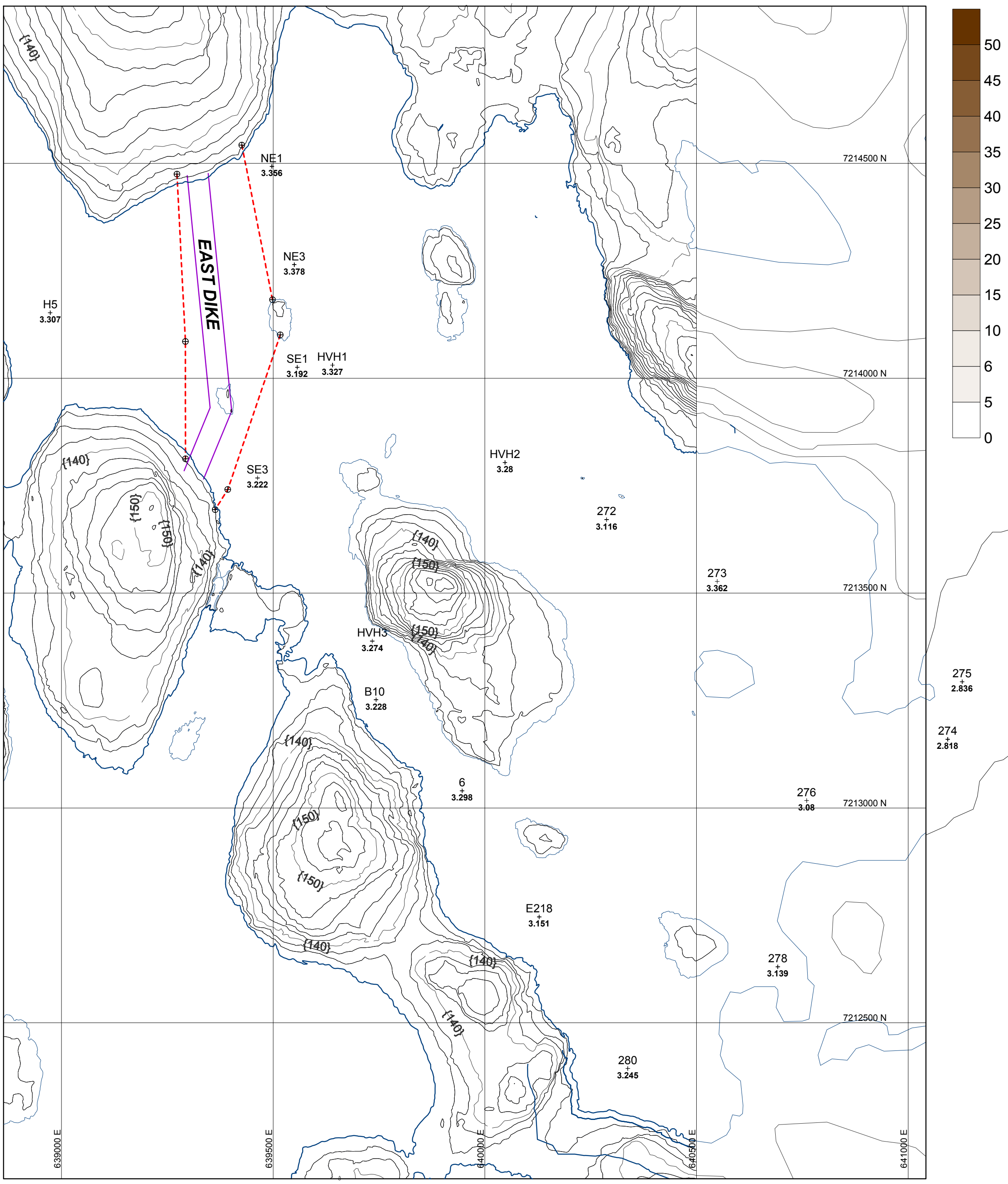
EAST DIKE CONSTRUCTION MONITORING 2008

SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN ALL DEPTHS) - SEPT 6

FIGURE 2-20

SE 2PL TSS.GRF



Legend
Monitoring Location
W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations
Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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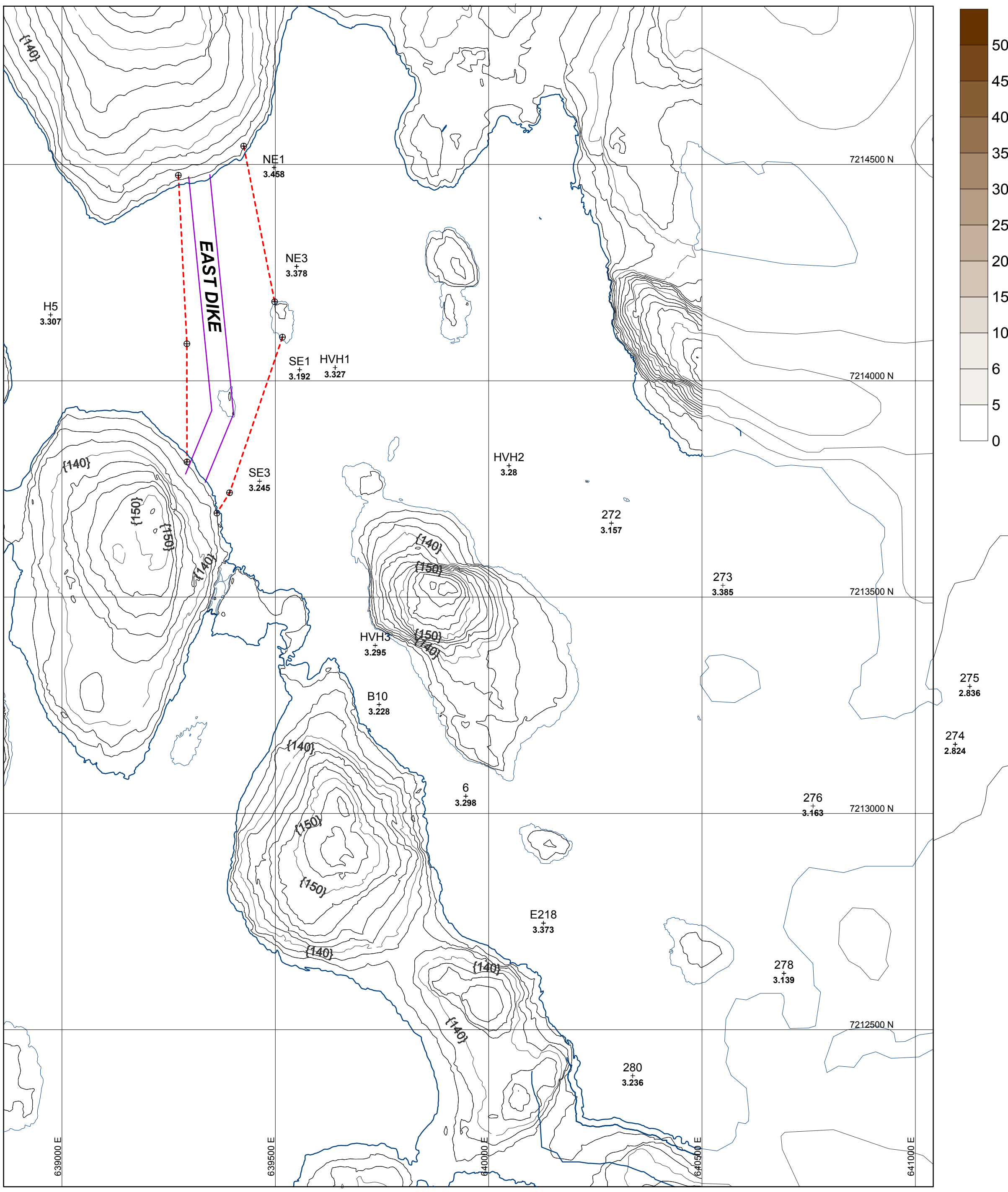
EAST DIKE CONSTRUCTION MONITORING 2008

SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN 0-5m) - OCT 13

FIGURE 2-21

SE 2PL TSS.GRF



Legend

⌖ Monitoring Location

W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations

Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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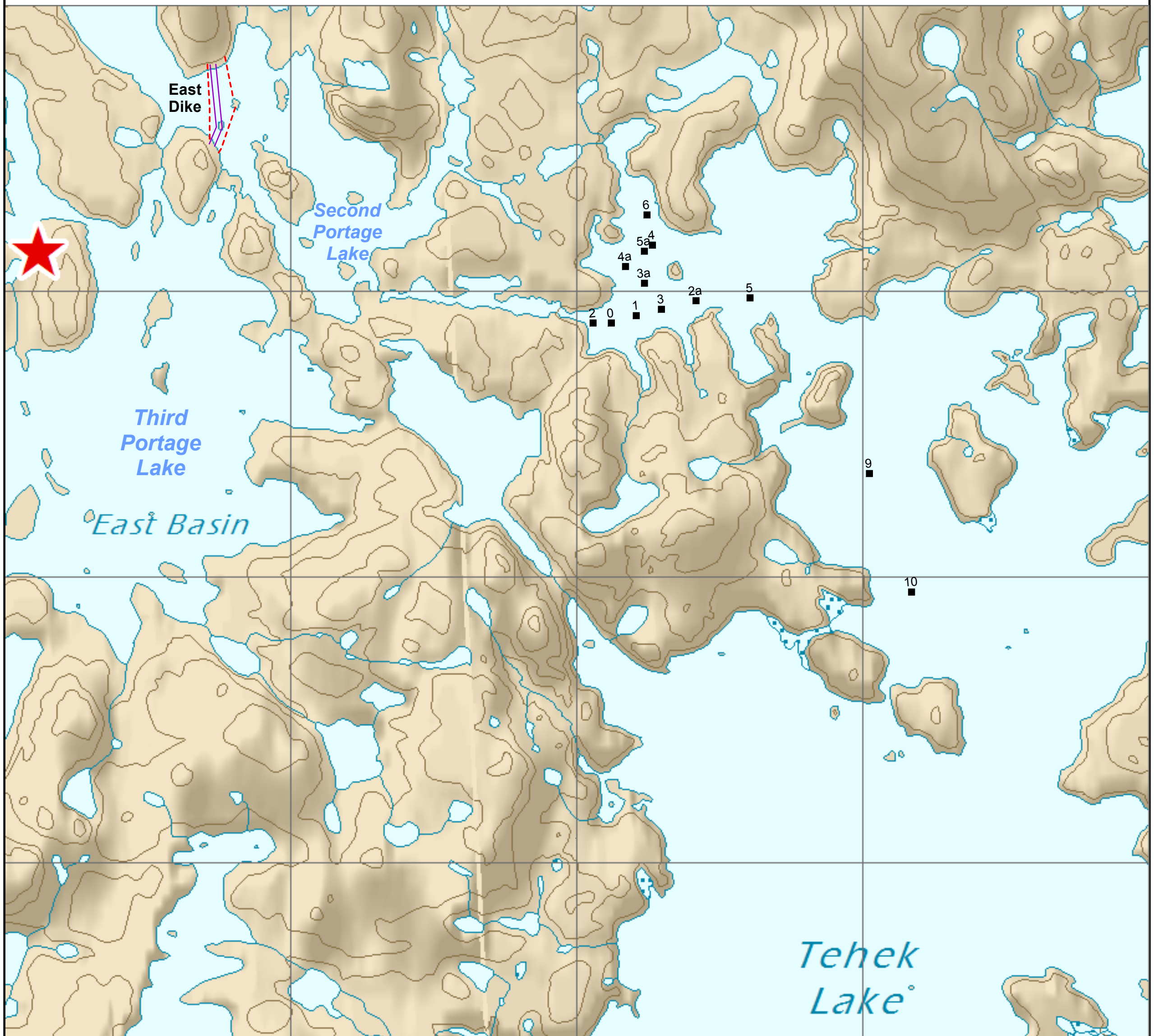
MEADOWBANK GOLD PROJECT
EAST DIKE CONSTRUCTION MONITORING 2008

SECOND PORTAGE LAKE
TSS (mg/L) SURVEY RESULTS (MEAN ALL DEPTHS) - OCT 13

FIGURE 2-22

SE 2PL TSS.GRF



Station	Easting	Northing	Map ID
THK1000	359951	7212151	0
THK1001	360175	7212197	1
TK-2	359793	7212165	2
THK1002	360708	7212281	2a
TK-3	360399	7212232	3
THK1003	360272	7212473	3a
TK-4	360370	7212800	4
THK1004	360119	7212633	4a
TK-5	361183	7212265	5
THK1005	360295	7212753	5a
THK1006	360346	7213067	6
TK-9	362091	7210639	9
TK-10	362368	7209573	10
Note: Positions in UTM (15W); NAD83.			

Legend

Monitoring Location

W*n*, NE*n*, SE*n* = Routine Stations
HVH*n* = High Value Habitat Stations

Green symbols = reference areas
Red symbols = target areas

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

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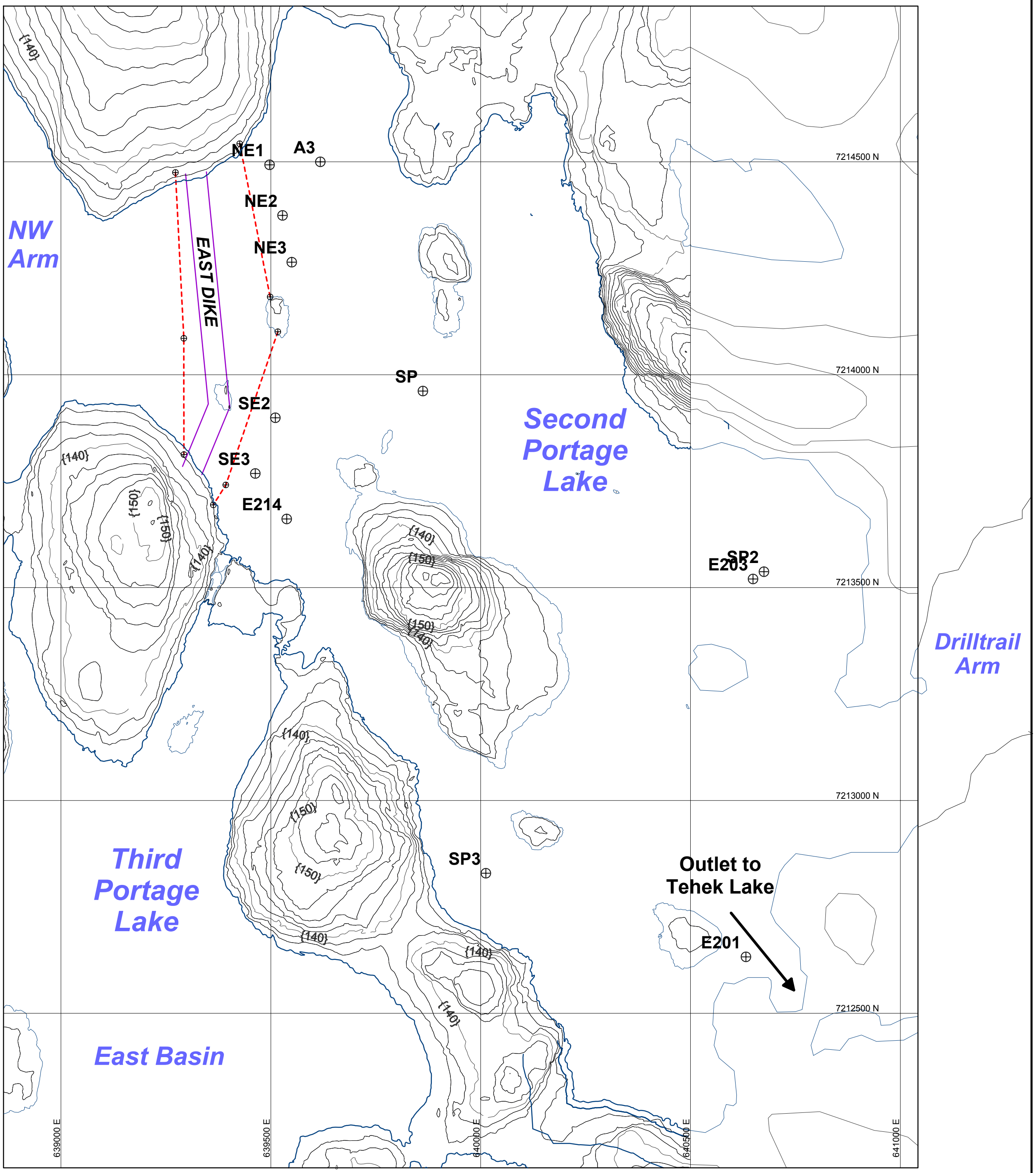
EAST DIKE CONSTRUCTION MONITORING 2008

TEHEK LAKE TSS MONITORING STATIONS
AUGUST 30 AND SEPTEMBER 11

FIGURE 2-23

TEHEK TSS Stns.GRF



Date	Stations Monitored
9-Aug-08	SE2; SE3; NE2
16-Aug-08	SE2; SE3; NE1; NE3
22-Aug-08	E214; SP; A3; SP2; SP3
2-Sep-08	E214; E201
3-Sep-08	A3; E203
12-Sep-08	SE2; SE3; NE1

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MEADOWBANK GOLD PROJECT
EAST DIKE CONSTRUCTION MONITORING 2008

WATER QUALITY
MONITORING STATION LOCATIONS

FIGURE 2-24

SE 2PL TSS.GRF

Photo 2-1. East Dike Construction Zone on July 30.

Photo 2-2. East Dike in-water construction on July 31.

Photo 2-3. Elevated TSS appears to be contained by turbidity barriers - July 31.

Photo 2-4. Analite turbidity probe in action.

Photo 2-5. William Scottie recording turbidity monitoring results.

Photo 2-6. East Dike Construction Zone on August 8.

Photo 2-7. East Dike Construction on North Shore.

Photo 2-8. East Dike Construction Zone on August 22.

Photo 2-9. Drilltrail Arm Remains Clear on August 22.

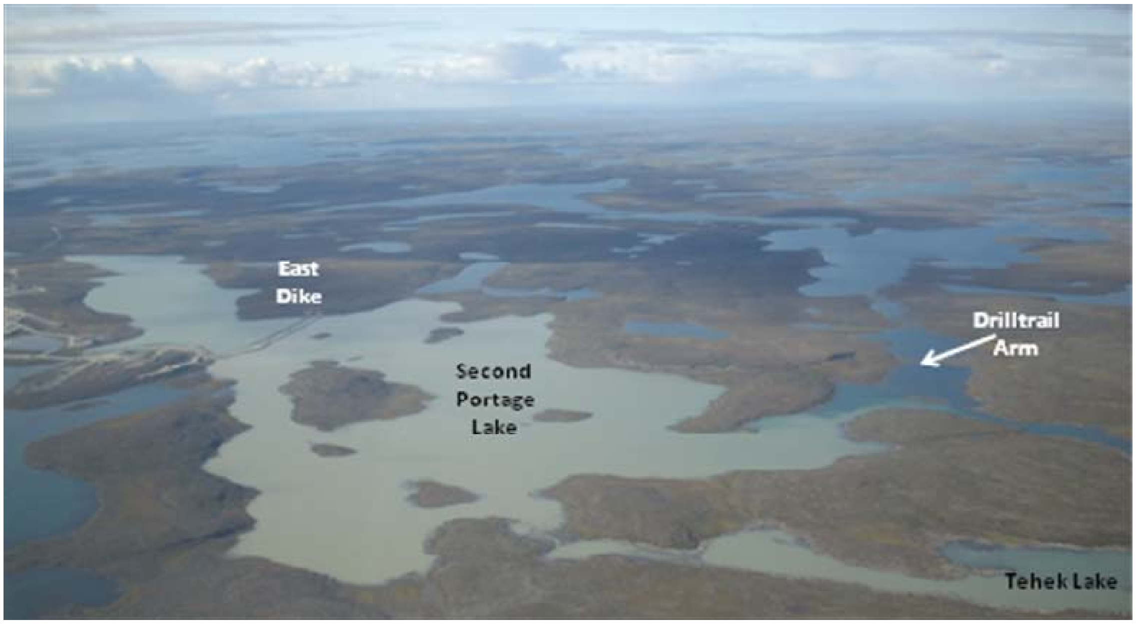


Photo 2-10. Sediment plume in Tehek Lake on August 22 showing strong west-to-east gradient.

3. WESTERN CHANNEL DIKE CONSTRUCTION MONITORING

3.1. Overview

The general monitoring framework for dike construction was documented in the *Water Quality Monitoring and Management Plan for Dike Construction and Dewatering at the Meadowbank Mine* (AEM, 2008a); key aspects were presented in **Section 2.1**. This report presents the results of the monitoring component of the plan (see **Figure 2-1**). While the principles of the framework were maintained for monitoring construction of the Western Channel Dike, certain modifications were made to meet the specific needs of the situation (see **Section 3.2** for details).

As shown in **Figure 1-1**, the Western Channel Dike essentially blocks off the western-most of the three outlet channels from Third Portage Lake into Second Portage Lake. There is approximately 1 m elevation difference between the two lakes.

3.2. Methods

Based on the general layout and scale of the Western Channel Dike (see **Figure 1-1**), routine monitoring stations were situated just upstream (i.e., in Third Portage Lake; station WCT) and just downstream (i.e., in the impounded NW arm of Second Portage Lake; station WCS) of the construction area, on the outside of the turbidity barriers. The upstream Third Portage Lake side of the construction zone was isolated by two turbidity barriers, a silt fence and a cofferdam (0 to 3/4" material). Sediment control measures for the downstream side included two turbidity barriers and two silt fences. In addition, a rockfill platform was constructed across the channel as one of the first steps in construction and lined on the upstream side with a layer of the same material used for the upstream cofferdam. The W series of stations from East Dike monitoring were also monitored routinely.

Turbidity surveys assessing conditions over a larger spatial scale within the impoundment were also conducted periodically throughout the monitoring period.

With the onset of construction starting on September 23, monitoring frequency was set to at least one (preferably two) events per day, weather permitting. General turbidity monitoring methods (and estimation of TSS concentrations) and applicable QA/QC were similar to those described in **Section 2.2**. Water chemistry monitoring was not conducted during this monitoring program for the following reasons:

- The downstream receiving environment was already isolated from Second Portage Lake.

- The magnitude and extent of construction-related sediment inputs were minor compared to the East Dike, where extensive water quality monitoring was conducted.
- No applicable TSS triggers were exceeded in the Impoundment.

3.3. Results

Turbidity monitoring was conducted between September 23 and October 15, 2008. In addition to the routine stations WCT and WCS, the W series of stations from East Dike monitoring were also frequently monitored. Note that, as per the approved monitoring framework, TSS triggers for high-value habitats do not apply in the impoundment area. The daily moving 24-hr and 7-day average TSS[5] concentrations for each routine monitoring station are shown in **Figure 3-1** (results for daily maxima, 24-hr averages and 7-day averages for each routine station each day are provided in **Appendix D**); results for W stations are reported in **Section 2.3.1**, with detailed daily results in **Appendix B**. Key results were as follows:

- **General** –Field turbidity measurements taken in Second Portage Lake (prior to East Dike construction) and in other project lakes suggest background concentrations typically of approximately 0.3 to 1 NTU, which, using the final site-specific TSS-turbidity relationship (see **Figure 2-3**), would equate to approximately 0.2 to 0.6 mg/L TSS.
- **Third Portage Lake (WCT)** – TSS never increased above background concentrations (varying between 0.2 and 0.5 mg/L) with no construction-related trends. The area was frozen by October 13 (**Photo 3-1**), so further monitoring did not occur.
- **Impoundment (WCS)** – TSS concentrations at WCS were approximately 4 mg/L at the onset of monitoring on September 23, reflecting general conditions in the impoundment at that time (i.e., already elevated above background due to earlier inputs from construction activities at the East Dike). TSS concentrations increased over the first week of construction, but did not exceed either the STM or MMM trigger values of 50 mg/L or 15 mg/L, respectively. Concentrations then stabilized for most of the remaining monitoring period.
- **Impoundment (W stations)** – Similar to station WCS, TSS concentrations in the impoundment were approximately 4 mg/L at the start of construction on the Western Channel Dike. Twenty-four hour average concentrations rose steadily

[5] Apart from TSS measurements taken to establish the TSS-turbidity relationship or as part of the water quality sampling, all TSS concentrations reported herein are estimates made from direct monitoring of turbidity (see **Section 2.2** for details).

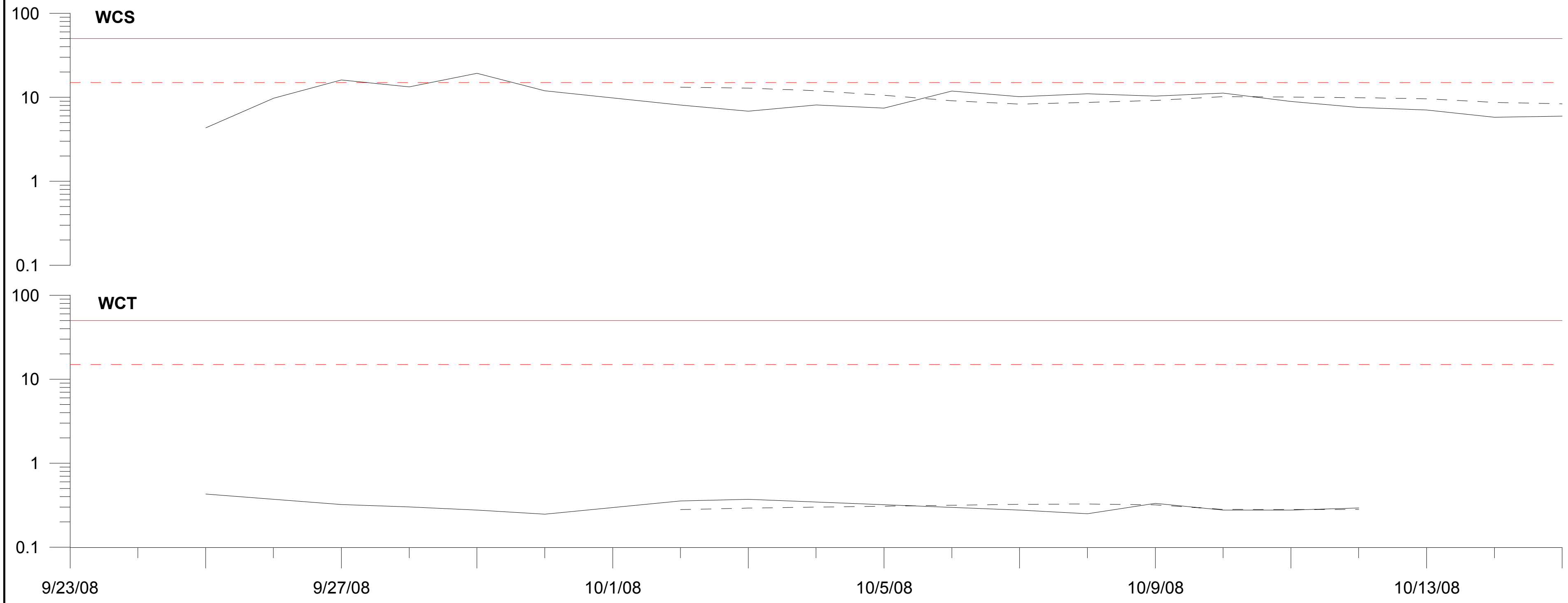
over the first week of construction, peaking at 10.9 mg/L on September 30 , well under the STM. The 7-day average TSS concentrations peaked at 8.8 mg/L on October 2, also under its respective trigger (i.e., the MMM).

Photo 3-2 shows the Western Channel Dike construction zone on October 4. Third Portage Lake is to the left and the Impoundment on the right. Third Portage Lake water clarity is excellent and shows that source control measures worked well to prevent sediment introduction. The biggest challenge for the downstream side was minimizing sediment inputs to the impoundment while water was still flowing. As mentioned in **Section 3.2**, the rockfill platform and filter layer were meant to minimize flows and retain sediments locally. Water still flowing through the work zone did become turbid, but was largely contained by the double layers of silt fencing and turbidity barriers.

3.4. Summary

Water quality monitoring for Western Channel Dike construction was conducted between September 23 and October 15, 2008. Routine monitoring stations were situated just upstream (i.e., in Third Portage Lake; station WCT) and just downstream (i.e., in the impounded NW arm of Second Portage Lake; station WCS) of the construction area, on the outside of the turbidity barriers. In addition, the W series of stations from East Dike monitoring were also monitored routinely. Note that, as per the approved monitoring framework, TSS triggers for high-value habitats do not apply in the impoundment area. Key results were as follows:

- TSS concentrations at the upstream WCT station did not increase over the course of monitoring. They varied between 0.2 and 0.5 mg/L, which is consistent with background concentrations (see **Section 2.3.1** for discussion on general background concentrations).
- TSS concentrations at the downstream WCS station increased over the first week of construction (maximum 7-day average TSS concentration was 13.2 mg/L), but did not exceed applicable trigger values. Concentrations stabilized or decreased over the remainder of the monitoring period.
- TSS concentrations at the W stations also increased over the first week of construction, but remained below applicable trigger values. Concentrations stabilized or decreased over the remainder of the monitoring period.



Legend

- 24-hr Trigger
- 7-day Trigger
- 24-hr Ave TSS
- 7-day Ave TSS

TSS Trigger Values (mg/L)

Station	24-hr Ave	7-d Ave
Routine	50	15
HVH_a	50	15
HVH_b	25	6

a = prior to Sept 1
b = after Sept 1

Azimuth Consulting Group Inc.

MEADOWBANK GOLD PROJECT
WESTERN CHANNEL DIKE CONSTRUCTION MONITORING 2008

TSS (mg/L) MONITORING RESULTS FOR ROUTINE STATIONS

FIGURE 3-1

WCD Time Series.GRF

Photo 3-1. Ice-bound Zodiac at station WCT on October 13.

Photo 3-2. Western Channel Dike construction zone – October 4.

4. REFERENCES

Agnico-Eagle Mines Ltd (AEM). 2008a. Water quality monitoring and management plan for dike construction and dewatering at the Meadowbank Mine. Revised Final. July 2008.

AEM. 2008b. Meadowbank Gold Project: 2007 Annual Report - All-Weather Private Access Road. March 2008.

Azimuth Consulting Group (Azimuth). 2009. Aquatic Effects Monitoring Program – Targeted Study: Second Portage Lake TSS Effects Assessment Study, Meadowbank Gold Project, 2008. Report prepared by Azimuth Consulting Group Inc. Vancouver BC for Agnico-Eagle Mines Ltd., Vancouver, BC. March 2009.

Canadian Council of Ministers of the Environment (CCME). 2007. Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, 1999, updated December 2007.

Department of Fisheries and Oceans (DFO). 2000. Effects of sediment on fish and their habitat. Habitat Status Report 2000/01 E, DFO Pacific Region, January 2000, 9p.

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APPENDICES

APPENDIX A

STANDARD OPERATING PROCEDURE
MEADOWBANK STUDY LAKES & BAKER LAKE
WATER & PHYTOPLANKTON SAMPLING 2008

Standard Operating Procedure
Meadowbank Study Lakes & Baker Lake
Water & Phytoplankton Sampling 2008

GENERAL:

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Telephone: 604-730-1220
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Email: mmcconnell@azimuthgroup.ca

In case of **emergency**, contact Gary Mann (Azimuth telephone number 604-730-1220 or cell phone 604-908-0601).

LOCATION AND TIMING FOR FIELD ACTIVITIES:

Ten sampling stations have been chosen for water quality monitoring in the Meadowbank study lakes are and Baker Lake. These stations (with their corresponding abbreviation) are:

- Third Portage Lake – North Basin (TPN)
- Third Portage Lake – East Basin (TPE)
- Third Portage Lake – South Basin (TPS)
- Second Portage Lake (SP)
- Tehek Lake (TE)
- Wally Lake (WAL)
- Inuggugayualik Lake (INUG)
- Baker Lake – Barge Dock (BBD)
- Baker Lake – Proposed Jetty (BPJ)
- Baker Lake – Akilahaarjuk Point (BAP)

The **target water depth** at each sampling station is approximately 8 to 12 meters; Wally Lake is the exception, with a total water depth of approximately 6 meters (target water depth is 5 to 6 meters). The **UTM coordinates** for each sampling station, measured using a GPS unit in NAD 83, and the range of water depths found at each station are presented in the following table:

Sampling Station	Easting	Northing	Water Depth (m)
TPN	14W 636503	7215322	11.3
TPE	14W 0638738	7211300	12.4
TPS	14W 633840	7208079	15.1
SP	14W 639832	7213979	18.4
TE	15W 360061	7212182	8.2
WAL	15W 360424	7221343	6.0

INUG	14W 622843	7216842	7.6
BBD	14W 644467	7135221	12.8
BPJ	15W 357188	7134092	11.5
BAP	15W 363884	7131039	16.5

Field activities are scheduled for three times per year. The first sampling will take place in the spring just after ice-off, in **early July**. The second in **late August**, and the third in **mid September**.

WATER CHEMISTRY & PHYTOPLANKTON SAMPLING:

1. Gather **field collection materials**:
   In the boat:
   - Field collection data forms, pencils, waterproof markers & clipboard
   - GPS unit, batteries
   - Water pump & 12V battery
   - Tubing (8 meter length and 1 meter length) & weight (& extra C-clamps and cable ties)
   - Water filter apparatus, hand-held vacuum pump, tweezers
   - YSI meter, batteries
   - Secchi disk
   - pH meter, batteries
   - Depth meter, batteries
   - Bucket
   - Rope
   - Sampling gloves
   - Field sample bottles & preservatives (per sampling station):
     - 1 – 1 L plastic
     - 1 – 250 mL amber glass
     - 2 – 125 ml amber glass
     - 1 – 250 mL plastic
     - 2 – 500 mL amber glass
     - 1 – 125 mL amber glass (narrow black lid)
     - Ashless filter, tinfoil, ziploc plastic bag
     - 1 vial nitric acid
     - 2 vial hydrochloric acid
     - 3 vial sulfuric acid
     - 1 syringe & magnesium carbonate slurry
     - 1 syringe & Lugol's solution
   - Extra sample bottles in case of breakage or loss
   - QA/QC field duplicate sampling containers & preservatives (same as above), at one randomly selected sampling station per sampling event

   In camp:
   - Labels for sampling containers
   - Coolers (for storing and shipping samples)
   - Ice packs (for shipping samples to laboratories)
   - Address labels for coolers
   - Chain-of-custody forms

- Large Ziploc bags (for sending chain-of-custody form in cooler)
- Packing tape (for affixing labels to sampling containers & sealing cooler)

2. Before going into the field, **label** all **sampling containers** (including one ziploc bag for chlorophyll a filter). Using a permanent waterproof marker, fill in the labels with the following information:
   - Azimuth company name
   - Station abbreviation (e.g. TPE, INUG)
   - Date of sample collection
   - Parameters to be measured from individual bottle (conventionals, total metals, etc.)
   - Type and amount of preservatives

   The following table lists the specific bottles to be filled, parameters to be measured and preservatives required for each. Affix the labels to the sampling containers and then wrap packing tape around the labels to ensure a waterproof seal.

Sampling Container	Parameters to be Measured	Preservatives to be Added
1 L plastic	Conventionals*	None
250 mL amber glass	TKN, Ammonia	1 vial of sulfuric acid
1 filter (of 1 L water)	Chlorophyll-a	1-2 drops of magnesium carbonate slurry in water for last of filtering; wrap filter in tinfoil and place in ziploc bag
250 mL plastic	Total Metals	1 vial of nitric acid
125 mL amber glass	TOC	1 vial of hydrochloric acid
125 mL amber glass	DOC	1 vial of hydrochloric acid
2 x 500 mL amber glass	Oil and Grease	2 vial of sulfuric acid
125 mL amber glass (narrow black lid)	Phytoplankton	1 mL of Lugol's solution per 125 mL sample

* includes: hardness, conductivity, pH, TDS, TSS, nutrients (nitrate, nitrite, orthophosphate and total phosphate), chloride, sulfate, alkalinity (bicarbonate, carbonate & hydroxide).

3. For **QAQC** purposes, one field duplicate is collected per sampling event. All parameters measured in the original sample are measured in the field duplicate. The sampling station is selected randomly from one of the seven stations, and labeled as station DUP. Prepare the QAQC labels and affix to the sampling containers, as described in step 2.

4. Before and during sampling fill in the requested information on the **field data form**; complete one field data form in its entirety for each sampling station and sampling event. Forms are made of waterproof paper; **print** all information on the form using a **lead pencil** or a write-in-the-rain pen.

5. With the aid of a GPS unit, **navigate the boat** to the sampling station using the UTM coordinates (in NAD 83) provided. Approach the station from downstream of the wind direction. In windy conditions, anchor the boat upstream of the station and drift back; it is not necessary to anchor the boat in calm conditions providing the boat remains in the same

position. Do not allow the anchor to drag through the sampling station. Record the exact UTM coordinates on the field data form.

6. Measure the **water depth** at the sampling station using the 'Hawkeye' hand-held depth meter (note: place depth meter in water ***before*** pushing ON button). Hold the meter in the water, facing the lake bottom, until the meter measures the depth. Record this information on the field data form.

7. Measure the **light attenuation** at the sampling station using the Secchi disk. Lower the disk into the water, on the shady side of the boat, so that you can no longer see it. Slowly raise the disk to the point that you can see it and measure this depth using the markings on the disk rope.

8. Measure the **pH** of the water at the sampling station using the pH meter. Hold the probe portion of the meter in the lake until the meter measures the pH. Record this information on the field data form.

9. Lower the YSI probe into the lake to just below the water surface level. Measure the **temperature**, **conductivity** and **dissolved oxygen** concentrations in the water and record on the field data form. Lower the meter to a depth of 1 m and record the field measurements. Allow the concentrations on the meter to stabilize for 10 to 15 seconds before recording the concentrations. Continue recording the field measurements at 1 m depth intervals until you reach the whole metre mark above the lake bottom (i.e. if the lake depth is 9.3 meters, record field measurements up to a depth of 9 meters).

10. Set up the **water pump** in the boat; attach the tubing to the pump using the C-clamps and attach the 12V battery. Attach the 8 meter length of tubing to the intake valve, and the 1 meter length to the output valve. Attach the ball weight to the end of the 8 meter length of tubing. Lower the 8 meter length of tubing into the water about half way (i.e., at 4 meters depth) and place the 1 meter length of tubing over the edge of the boat. Run the pump for **2 minutes** to flush the sampling device.

11. For each sampling station, **fill** the required **pre-labeled sampling containers** with water from the 1 meter length of tubing. **Add** the **specified preservatives** to the appropriate sampling containers (according to the information on the labels and table in step 2), seal and mix thoroughly by turning upside down and then upright a number of times.

12. Rinse all sections of the water filter apparatus with site water. Using the tweezers, place an ashless filter paper on the screen in the water filter apparatus, then screw the two sections together and attach the hand-held vacuum pump. **Filter 1 L of water** through the water filter apparatus. *Add 1 – 2 drops of magnesium carbonate slurry to the last few ml of water and pump through the apparatus and filter paper*. Wrap the filter paper in a piece of tinfoil, then place the filter in the pre-labeled ziploc bag.

13. Until ready for shipping, the **water samples** are stored **chilled** (on ice) in a cooler or in a refrigerator in camp, if space is available. Ice can usually be obtained from the local

surroundings in early July. The **filter** for chlorophyll-a analysis must be **frozen**; store this bag in a deep freezer in the camp. The labels on the water sampling containers may be wrapped in packing tape and the bottles put in plastic bags prior to storage on ice to protect the labels from water damage. The **phytoplankton samples** are stored at **room temperature**. Seal these jars with electrical tape; the jars tend to leak.

14. If this sampling station is selected as the QAQC **field duplicate**, collect a second set of water samples (repeat step 10), fill the pre-labeled sampling containers (repeat step 11) and collect a second filtered chlorophyll a sample (step 12). Record which sampling station the QAQC samples are collected from on the appropriate field data form.

15. Fill out a **chain-of-custody** form for the water samples and filters being sent to **ALS Environmental**. The COC form must be completed carefully and in its entirety to ensure proper analysis. This includes listing all of the specific conventional parameters (see table in step 2), Azimuth and ALS contact names, and checking off all of the specific boxes for requested analyses. The ALS laboratory quote number (**ALSEQ 07-622**) must be printed on the COC form to ensure proper billing.

    A digital COC form is available; this form can be filled out in advance to ensure accuracy and efficiency and amended in the field as required. Note that using a digital copy of the COC requires printing 2 copies of the document in the field (one for the laboratory, one for Azimuth). Ensure printing services are available in camp prior to using the digital version of the form. Any questions regarding the COC form should be directed to the Azimuth project coordinator – Maggie McConnell. Put the completed COC form in a sealed ziploc plastic bag in a cooler with the water samples.

16. Fill out a **chain-of-custody** form for the phytoplankton samples being sent to **Plankton R Us Inc.**, Winnipeg, MB. Complete all of the required fields and then put the form in a sealed ziploc plastic bag in the cooler with the phytoplankton samples.

<u>PACKAGING & SHIPPING SAMPLES:</u>

1. Ensure all **water samples** are **sealed** securely. **Pack** water sampling containers upright in coolers with ice packs, and packing material, to ensure samples do not spill or break during transport. (Ideal storage and transport temperature is 4°C).

2. Ensure the COC form is enclosed and then seal the cooler(s). **Label the cooler**(s) with the following address:

   ALS Environmental
   1988 Triumph Street
   Vancouver, BC, Canada
   V5L 1K5
   Tel: 604-253-4188
   Attention: Natasha Marcovic-Mirovic

3. Ensure **phytoplankton samples** are **sealed** securely and **pack** in a cooler with packing material to ensure samples do not break during transport. It is not necessary to keep samples cool.

4. Ensure the COC form is enclosed and then seal the cooler. **Label the cooler** with the following address:

   Dr. David Findlay
   Plankton R Us Inc.
   39 Alburg Drive
   Winnipeg, MB
   R2N 1M1
   Tel: 204-254-7952

5. **Ship** the water **samples** to ALS Environmental as quickly as possible. Ship the phytoplankton samples to Dr. D. Findlay when convenient.

6. Notes about shipping with **Calm Air Cargo**: 1) ask for ***Priority*** shipping with Calm Air ***AND*** with Air Canada from Winnipeg, 2) ask to charge bill to ***AEM***, 3) be sure to include contact name and phone # on the ***cooler label*** and on the ***waybill***; and text saying that they will call lab upon arrival should also be on waybill, 4) keep a copy of the waybill # and follow up with the Winnipeg Calm Air Cargo office [Chris or Karla at: **(204) 956-6101**], 5) follow up with respective labs to be sure they received notice of shipment arrival and that they've sent a courier to pick up from **Air Canada Cargo**.

7. Send completed **COC forms** and **field data forms** to **Azimuth** Consulting Group Inc., attention the project coordinator – Maggie McConnell.

APPENDIX B

DAILY SUMMARY OF TSS CONCENTRATIONS FOR ROUTINE AND HIGH VALUE HABITAT MONITORING STATIONS – EAST DIKE

Appendix B
East Dike Construction Monitoring 2008
Daily Summary of TSS Concentrations for Routine and High Value Habitat Monitoring Stations.

		Routine Stations														
	Station:	W1			W2			W3			W4			NE1		
	Time Period:	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave
Date of Analysis	Time of Analysis															
31-Jul-08	17:00	1.5	0.51 (n/a)	0.51 (n/a)	2.6	1.7	1.05 (n/a)	1.6	1.5	1.09 (n/a)	1.7	1.5	1.19 (n/a)	#N/A	#N/A	#N/A
1-Aug-08	17:00	4.6	2.8	1.66 (n/a)	3.1	2.4	1.67 (n/a)	2.6	1.8	1.41 (n/a)	7.1	3.2	2.12 (n/a)	1.6	1.11 (n/a)	1.11 (n/a)
2-Aug-08	17:00	5.9	4.0	2.84 (n/a)	5.2	4.0	2.27 (n/a)	5.4	3.5	1.96 (n/a)	10.2	5.3	3.29 (n/a)	4.8	4.4	3.14 (n/a)
3-Aug-08	17:00	4.0	2.7	2.81 (n/a)	5.0	3.2	2.49 (n/a)	5.5	3.8	2.44 (n/a)	4.7	3.1	3.26 (n/a)	5.0	4.7	3.78 (n/a)
4-Aug-08	7:00	3.4	2.2	2.77 (n/a)	4.3	3.4	2.69 (n/a)	5.7	4.8	2.78 (n/a)	3.7	3.1	3.24 (n/a)	5.0	4.1	3.76 (n/a)
5-Aug-08	7:00	4.2	3.7	2.86 (n/a)	6.7	4.6	3.1 (n/a)	4.2	3.8	3 (n/a)	4.1	3.4	3.21 (n/a)	2.7	2.3	3.45 (n/a)
6-Aug-08	7:00	3.2	2.8	2.86 (n/a)	4.2	3.0	3.08 (n/a)	6.5	3.8	3.04 (n/a)	5.8	5.0	3.48 (n/a)	8.9	6.0	3.96 (n/a)
7-Aug-08	7:00	10.1	6.2	3.7	12.3	7.4	4.0	10.6	6.6	3.7	8.3	5.1	3.9	5.5	4.4	4.03 (n/a)
8-Aug-08	7:00	11.9	8.3	3.8	9.4	6.9	3.9	7.4	6.7	3.8	7.3	5.2	3.6	19.0	10.2	4.3
9-Aug-08	7:00	11.7	7.4	4.5	14.7	9.4	5.1	19.7	12.8	5.6	20.9	10.8	4.7	19.7	16.3	6.4
10-Aug-08	7:00	14.8	11.1	5.7	20.1	14.5	6.7	17.0	14.2	7.1	16.3	13.4	6.1	19.0	9.8	7.6
11-Aug-08	7:00	9.8	6.5	6.7	13.5	7.6	7.6	10.8	7.3	8.0	11.4	8.6	7.3	18.2	15.4	9.7
12-Aug-08	7:00	32.2	21.0	9.6	14.3	11.7	8.9	24.7	17.6	10.3	26.6	18.6	9.7	11.7	8.1	10.7
13-Aug-08	9:00	15.2	10.6	10.5	10.0	7.1	9.4	10.5	8.1	10.8	10.8	9.1	10.4	21.5	12.6	11.8
14-Aug-08	7:00	16.4	10.9	11.6	14.1	9.9	10.2	11.9	9.9	11.9	15.2	11.4	11.6	113.4	61.1	20.9
15-Aug-08	7:00	32.0	13.0	12.3	29.7	16.7	11.5	29.1	15.4	13.1	25.6	16.4	13.2	113.4	62.8	24.2
16-Aug-08	7:00	0.0	0.0	15.4	0.0	0.0	12.7	0.0	0.0	13.3	0.0	0.0	14.2	0.0	0.0	25.9
17-Aug-08	4:00	22.8	19.7	16.2	0.0	0.0	12.7	13.6	12.1	12.9	11.5	11.3	13.9	73.4	62.8	32.6
18-Aug-08	4:00	13.6	13.5	16.8	15.9	14.4	13.1	15.4	14.3	13.6	14.4	13.5	14.4	106.8	74.9	40.8
19-Aug-08	4:00	14.4	14.1	16.3	18.0	16.2	13.9	14.9	13.9	13.0	12.8	11.9	13.3	128.2	114.3	59.8
20-Aug-08	4:00	16.2	15.3	16.6	18.0	17.3	14.8	14.9	14.3	13.6	16.2	14.5	13.8	128.2	97.6	63.9
21-Aug-08	7:00	15.9	15.3	17.1	19.4	18.2	15.9	18.2	17.4	14.6	15.7	13.7	14.1	57.0	43.9	66.0
22-Aug-08	7:00	15.9	14.4	17.3	17.2	16.3	15.8	15.7	15.2	14.5	15.7	14.0	13.8	67.7	63.1	66.1
23-Aug-08	7:00	12.0	11.9	14.9	15.9	14.1	15.6	14.9	13.6	14.4	12.8	11.2	12.9	80.2	70.7	72.4
24-Aug-08	7:00	11.7	10.9	14.0	12.3	11.5	15.4	12.3	11.6	14.2	10.6	10.1	12.7	80.2	73.5	74.0
25-Aug-08	7:00	11.2	10.6	13.3	11.2	10.9	14.9	11.5	11.2	13.9	11.2	10.9	12.4	66.7	54.0	71.8
26-Aug-08	7:00	10.6	10.5	12.7	12.2	11.2	14.1	11.2	10.9	13.4	12.0	11.0	12.2	46.9	41.0	61.3
28-Aug-08	7:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
29-Aug-08	7:00	7.2	7.2	10.1	7.4	7.4	11.2	7.1	7.1	10.7	7.3	7.3	10.1	25.2	25.2	47.7
30-Aug-08	7:00	7.9	7.9	9.4	8.7	8.7	10.2	7.5	7.5	9.6	7.6	7.6	9.5	19.7	19.7	41.3
31-Aug-08	7:00	11.1	11.1	9.0	10.2	10.2	9.7	10.0	10.0	8.9	8.9	8.9	8.9	22.7	22.7	29.9
1-Sep-08	7:00	11.1	9.9	9.1	10.2	9.9	9.8	10.0	9.6	9.0	10.1	9.5	9.0	22.7	22.2	29.2
2-Sep-08	7:00	6.9	6.9	8.6	7.9	7.9	9.3	8.0	8.0	8.6	7.6	7.6	8.6	21.7	21.4	25.2
3-Sep-08	7:00	7.3	7.1	8.4	7.9	7.7	8.7	8.0	7.9	8.4	7.6	7.3	8.2	19.7	19.7	21.5
4-Sep-08	7:00	7.1	7.1	8.2	6.8	6.8	8.5	7.1	7.1	8.2	7.3	7.3	8.0	19.1	19.1	21.1
5-Sep-08	7:00	6.1	6.1	8.0	6.9	6.9	8.2	6.4	6.4	8.1	6.3	6.3	7.9	16.8	16.6	20.2
6-Sep-08	7:00	6.1	6.0	7.8	6.9	6.6	8.1	6.4	6.3	7.9	6.3	6.2	7.7	16.8	16.5	19.8
7-Sep-08	7:00	5.4	5.4	7.1	5.4	5.4	7.4	5.3	5.3	7.4	5.1	5.1	7.2	13.3	13.3	18.8
8-Sep-08	7:00	6.1	6.1	6.6	6.5	6.5	7.0	6.2	6.2	6.9	6.4	6.4	6.8	13.2	13.2	17.7
9-Sep-08	7:00	6.0	6.0	6.2	5.7	5.7	6.4	6.0	6.0	6.3	5.3	5.3	6.2	12.8	12.8	15.7
10-Sep-08	7:00	5.3	5.3	5.9	5.7	5.7	6.1	5.7	5.7	6.0	5.7	5.7	5.9	10.4	10.4	14.1
12-Sep-08	15:00	5.3	5.3	5.7	5.3	5.3	5.8	5.0	5.0	5.7	5.3	5.3	5.7	9.2	9.2	12.2
13-Sep-08	14:00	5.0	5.0	5.6	5.3	5.3	5.7	5.3	5.3	5.7	5.3	5.3	5.6	8.4	8.4	11.4
14-Sep-08	14:00	4.8	4.8	5.5	4.7	4.7	5.6	4.6	4.6	5.6	4.5	4.5	5.5	8.7	8.7	9.6
15-Sep-08	14:00	4.8	4.8	5.5	4.7	4.7	5.6	4.6	4.6	5.6	4.5	4.5	5.5	8.1	8.1	9.4
16-Sep-08	14:00	4.8	4.8	5.5	4.7	4.7	5.6	4.6	4.6	5.6	4.5	4.5	5.5	7.2	7.2	9.1
17-Sep-08	14:00	4.7	4.7	5.0	5.0	5.0	5.1	5.3	5.3	5.1	5.3	5.3	5.1	6.9	6.9	8.1
18-Sep-08	14:00	4.5	4.5	4.8	4.7	4.7	5.0	4.4	4.4	5.0	4.4	4.4	5.0	6.9	6.9	7.9
19-Sep-08	14:00	4.4	4.4	4.8	4.4	4.4	4.9	4.7	4.7	4.9	4.4	4.4	4.9	6.4	6.4	7.5
20-Sep-08	14:00	NND	NND	4.8	NND	NND	4.9	NND	NND	4.9	NND	NND	4.9	NND	NND	7.5
21-Sep-08	20:00	4.1	4.1	4.4	3.9	3.9	4.4	4.0	4.0	4.5	3.8	3.8	4.4	5.4	5.4	6.9
23-Sep-08	16:00	4.2	4.2	4.3	4.2	4.2	4.3	4.3	4.3	4.4	4.3	4.3	4.3	6.2	6.2	6.2
25-Sep-08	20:00	4.2	4.2	4.2	4.1	4.1	4.2	4.0	4.0	4.3	4.1	4.1	4.1	6.6	6.6	6.0
27-Sep-08	19:00	7.0	7.0	4.7	7.7	7.7	4.7	7.9	7.9	4.8	7.5	7.5	4.7	NND	NND	6.0
28-Sep-08	22:00	7.0	6.6	5.0	7.7	7.0	5.1	7.9	7.5	5.2	7.5	7.3	5.1	NND	NND	6.0
29-Sep-08	20:00	10.0	10.0	5.8	8.6	8.6	5.9	8.6	8.6	6.0	8.8	8.8	5.9	NND	NND	NND
30-Sep-08	23:30	10.9	10.9	6.5	12.0	10.3	6.4	10.4	10.4	6.5	10.7	10.7	6.5	5.3	5.3	6.1
2-Oct-08	21:00	7.0	7.0	8.7	7.2	7.2	8.8	7.4	7.4	8.6	7.0	7.0	8.6	4.6	4.6	5.7
3-Oct-08	20:00	7.0	6.5	8.3	7.2	6.5	8.4	7.4	6.6	8.3	7.0	6.5	8.3	NND	NND	NND
4-Oct-08	20:00	7.0	7.0	8.2	7.2	7.2	8.2	6.6	6.6	8.0	7.0	7.0	8.1	NND	NND	NND
5-Oct-08	21:00	7.0	7.0	8.1	7.2	6.9	8.2	6.6	6.6	7.8	7.0	6.9	7.9	NND	NND	NND
6-Oct-08	21:00	6.1	6.1	7.4	6.3	6.3	7.9	5.7	5.7	7.2	6.1	6.1	7.3	NND	NND	NND
7-Oct-08	20:00	6.1	5.8	6.4	6.3	6.1	6.5	5.8	5.8	6.3	6.1	6.1	6.5	NND	NND	NND
8-Oct-08	20:00	8.0	6.8	6.5	8.0	7.0	6.6	7.9	6.9	6.3	8.2	7.2	6.6	NND	NND	NND
9-Oct-08	18:00	6.3	6.3	6.6	7.8	7.8	6.8	8.1	8.1	6.6	7.0	7.0	6.8	NND	NND	NND
10-Oct-08	21:00	7.8	7.8	6.7	7.0	7.0	7.0	7.9	7.9	7.0	6.9	6.9	6.9	NND	NND	NND
11-Oct-08	20:00	7.8	7.6	6.8	7.1	7.0	7.0	7.9	7.4	7.0	7.4	7.2	6.9	NND	NND	NND
12-Oct-08	21:00	7.2	7.2	6.9	6.8	6.8	7.0	7.0	7.0	7.0	8.7	8.7	7.1	NND	NND	NND
13-Oct-08	18:00	7.5	7.4	7.0	7.0	6.9	7.1	7.0	6.9	7.1	8.7	8.0	7.3	3.8	3.8	3.8
14-Oct-08	20:00	5.9	5.9	7.2	5.6	5.6	7.1	5.9	5.9	7.3	6.2	6.2	7.4	NND	NND	NND
15-Oct-08	20:00	5.9	5.8	7.0	6.5	6.0	6.8	6.0	6.0	6.9	6.9	6.5	7.3	NND	NND	NND

		Routine Stations															High Value Habitat Stations								
	Station:	NE2			NE3			SE1			SE2			SE3			HVH1			HVH2			HVH3		
	Time Period:	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave
Date of Analysis	Time of Analysis																								
31-Jul-08	17:00	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.0	0.02 (n/a)	0.02 (n/a)	0.1	0.11 (n/a)	0.11 (n/a)	0.2	0.15 (n/a)	0.15 (n/a)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1-Aug-08	17:00	1.2	0.99 (n/a)	0.99 (n/a)	2.5	2.11 (n/a)	2.11 (n/a)	4.7	3.1	0.87 (n/a)	4.6	3.7	1.48 (n/a)	6.7	6.2	2.75 (n/a)	0.9	0.87 (n/a)	0.87 (n/a)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-Aug-08	17:00	2.9	2.1	1.92 (n/a)	2.9	2.5	2.49 (n/a)	5.4	3.0	1.99 (n/a)	7.2	5.6	2.97 (n/a)	7.4	6.8	4.24 (n/a)	2.4	1.8	1.32 (n/a)	2.2	1.28 (n/a)	1.28 (n/a)	8.6	5.87 (n/a)	5.87 (n/a)
3-Aug-08	17:00	2.2	1.7	1.84 (n/a)	2.9	2.1	2.35 (n/a)	5.4	3.7	2.43 (n/a)	6.4	4.9	3.47 (n/a)	28.7	19.3	7.84 (n/a)	4.1	2.8	1.96 (n/a)	2.2	1.5	1.44 (n/a)	10.4	5.4	5.6 (n/a)
4-Aug-08	7:00	2.6	1.7	1.83 (n/a)	2.7	2.4	2.37 (n/a)	4.6	3.8	2.67 (n/a)	4.1	3.8	3.48 (n/a)	28.7	16.9	8.66 (n/a)	3.2	2.6	2.11 (n/a)	1.8	1.7	1.52 (n/a)	18.6	9.6	7.25 (n/a)
5-Aug-08	7:00	2.2	1.9	1.89 (n/a)	1.9	1.7	2.22 (n/a)	5.0	3.0	2.8 (n/a)	6.6	5.7	3.87 (n/a)	16.2	12.5	9.01 (n/a)	3.3	2.9	2.32 (n/a)	2.3	2.0	1.62 (n/a)	6.3	5.7	7.77 (n/a)
6-Aug-08	7:00	2.3	2.1	1.93 (n/a)	2.4	2.0	2.18 (n/a)	2.1	1.9	2.68 (n/a)	6.9	6.2	4.23 (n/a)	27.1	13.7	9.74 (n/a)	2.6	2.1	2.27 (n/a)	1.8	1.7	1.63 (n/a)	4.9	4.1	6.94 (n/a)
7-Aug-08	7:00	3.2	2.8	2.08 (n/a)	2.9	2.7	2.26 (n/a)	4.9	3.7	3.0	24.1	15.7	6.3	40.6	26.8	13.0	3.2	2.5	2.31 (n/a)	1.7	1.6	1.63 (n/a)	12.5	7.8	7.11 (n/a)
8-Aug-08	7:00	2.6	2.5	1.8	3.0	2.5	1.9	2.9	2.4	2.6	22.9	17.4	7.5	27.5	26.4	13.3	2.5	2.0	1.9	1.5	1.4	1.36 (n/a)	17.1	10.7	6.27 (n/a)
9-Aug-08	7:00	3.7	3.4	2.1	10.0	5.4	2.5	3.4	3.0	2.6	12.4	10.4	8.4	28.0	22.8	15.5	3.6	3.1	2.2	3.5	2.0	1.5	17.1	11.6	7.2
10-Aug-08	7:00	5.8	4.5	2.5	7.2	5.4	3.0	11.2	8.8	3.6	12.0	9.3	9.1	19.1	12.9	16.5	7.2	4.9	2.6	3.5	2.1	1.6	11.1	9.2	7.8
11-Aug-08	7:00	6.8	4.0	3.0	10.9	6.4	3.8	11.2	6.1	4.1	12.4	11.4	10.4	20.2	15.4	17.4	9.1	6.3	3.4	2.8	2.5	1.8	14.6	10.1	8.1
12-Aug-08	7:00	6.4	5.4	3.5	5.2	5.1	4.4	6.9	6.4	4.8	13.4	10.7	11.1	26.2	23.0	19.4	7.5	6.0	4.0	3.1	3.0	2.0	11.3	8.7	8.6
13-Aug-08	9:00	9.5	6.9	4.2	6.9	5.6	4.9	6.9	6.0	5.3	25.5	22.3	13.4	30.6	28.3	21.6	10.8	7.5	4.8	3.4	3.0	2.3	34.7	25.1	11.8
14-Aug-08	7:00	32.6	16.5	6.3	18.0	12.1	6.3	7.5	6.0	5.8	41.3	34.9	17.3	428.1	266.5	65.1	11.5	7.5	5.6	4.4	3.9	2.5	42.3	39.4	17.1
15-Aug-08	7:00	32.6	17.6	8.1	18.0	12.7	7.1	18.4	8.8	6.5	232.8	84.1	26.9	333.4	235.3	84.4	41.1	19.3	7.9	12.3	5.3	3.0	47.1	40.2	19.8
16-Aug-08	7:00	0.0	0.0	10.9	0.0	0.0	9.8	0.0	0.0	9.3	0.0	0.0	77.4	0.0	0.0	85.0	0.0	0.0	10.0	0.0	0.0	4.7	0.0	0.0	22.9
17-Aug-08	4:00	37.9	30.5	14.6	34.6	31.8	14.0	21.9	15.0	10.6	333.4	126.8	96.1	252.1	184.3	111.6	18.4	14.3	11.6	11.2	9.7	5.7	29.3	25.4	25.0
18-Aug-08	4:00	26.6	18.7	16.4	33.1	20.5	15.6	15.2	12.4	11.1	37.4	28.8	95.4	381.3	326.7	148.9	14.9	12.5	12.2	10.1	9.2	6.6	24.9	23.5	26.4
19-Aug-08	4:00	28.2	25.3	20.7	38.9	28.5	20.1	16.2	15.6	12.9	33.3	29.0	102.5	493.2	455.6	231.0	15.2	14.8	13.9	12.0	11.2	8.2	29.3	27.9	30.6
20-Aug-08	4:00	28.2	21.4	22.5	31.3	22.9	22.3	38.7	25.4	15.6	41.3	31.4	105.5	467.4	418.5	277.9	30.6	21.7	15.2	18.7	14.1	9.7	25.2	23.3	30.1
21-Aug-08	7:00	32.0	27.4	23.1	22.6	20.6	23.5	20.4	19.3	18.2	57.8	53.0	101.2	232.8	113.1	258.6	21.4	19.3	17.9	15.2	14.8	11.3	45.2	40.0	30.4
22-Aug-08	7:00	27.7	24.0	23.9	22.6	21.0	24.6	18.7	18.3	19.4	58.4	49.7	97.7	347.2	280.5	264.5	19.7	17.0	17.6	15.7	15.4	12.5	36.4	29.1	28.9
23-Aug-08	7:00	27.5	22.0	24.2	31.5	25.0	25.3	19.2	18.1	19.1	40.6	36.1	53.5	441.3	394.8	313.8	19.7	17.6	17.7	16.2	15.7	13.1	28.4	26.1	27.8
24-Aug-08	7:00	27.5	26.3	23.6	31.5	26.8	24.6	21.4	20.3	19.9	31.5	25.9	37.5	441.3	266.7	324.4	19.7	18.2	18.3	16.2	16.1	13.7	30.4	29.4	28.0
25-Aug-08	7:00	25.2	24.8	24.4	22.1	22.0	24.7	21.4	20.8	20.9	37.2	28.8	37.4	298.3	187.9	306.2	22.3	19.6	18.9	16.9	16.4	14.7	32.6	31.5	29.2
26-Aug-08	7:00	27.9	26.6	24.4	35.1	30.6	24.0	19.7	18.8	21.4	24.9	23.2	36.5	78.0	74.3	262.9	20.2	17.9	20.0	15.7	14.9	15.7	46.3	38.4	30.5
28-Aug-08	7:00	NND	NND	NND	NND	NND	NND	19.6	19.6	19.3	20.5	20.5	31.9	19.9	19.9	198.4	17.2	17.2	18.2	NND	NND	NND	17.1	17.1	30.9
29-Aug-08	7:00	NND	NND	NND	NND	NND	NND	16.8	16.8	19.2	17.2	17.2	26.9	16.9	16.9	175.6	NND	NND	NND	NND	NND	NND	12.7	12.7	28.7
30-Aug-08	7:00	20.4	20.4	24.2	30.6	30.6	29.3	16.8	15.3	18.8	17.2	16.1	23.4	17.1	17.0	119.3	17.8	17.8	18.1	14.9	14.9	15.3	13.2	13.0	26.9
31-Aug-08	7:00	19.0	19.0	22.9	19.4	19.4	29.9	17.9	17.9	17.7	18.7	18.7	20.7	29.1	29.1	61.0	20.3	20.3	18.1	14.9	14.9	14.9	12.6	12.6	23.0
1-Sep-08	7:00	22.5	20.8	22.7	23.7	21.5	29.1	19.6	18.8	17.8	22.1	20.4	20.7	29.1	25.5	57.9	20.3	18.3	18.1	17.0	16.0	15.0	16.0	14.3	22.2
2-Sep-08	7:00	22.5	20.4	21.7	24.1	23.9	29.1	19.6	18.6	17.6	22.1	21.0	19.3	21.8	19.9	30.9	16.5	16.5	17.4	13.2	13.2	14.8	11.5	11.5	18.8
3-Sep-08	7:00	19.1	19.1	19.8	18.3	18.3	23.2	17.6	16.4	17.0	19.9	18.6	18.5	19.6	18.8	20.4	16.5	16.4	17.6	14.6	13.9	14.9	14.5	13.0	13.6
4-Sep-08	7:00	16.7	16.7	19.4	16.0	16.0	22.0	16.5	16.5	16.9	15.5	15.5	18.2	16.4	16.4	20.3	16.1	16.1	17.4	12.6	12.6	14.6	14.9	14.7	13.8
5-Sep-08	7:00	18.3	17.4	19.0	16.3	15.3	20.8	15.2	14.2	16.6	15.7	14.9	17.8	16.1	15.4	20.0	14.6	12.5	16.8	12.2	11.6	14.0	13.4	12.9	13.6
6-Sep-08	7:00	18.3	16.1	18.7	16.3	14.9	20.2	16.9	14.8	16.5	15.7	14.7	17.5	16.1	15.2	18.6	14.6	12.0	16.3	12.2	10.9	13.7	13.4	12.5	13.7
7-Sep-08	7:00	12.6	12.6	17.7	12.6	12.6	18.3	12.0	12.0	16.3	14.0	14.0	17.2	13.5	13.5	18.0	11.5	11.5	15.2	8.6	8.6	12.8	12.4	12.4	13.4
8-Sep-08	7:00	13.3	13.3	16.8	11.8	11.8	17.1	15.7	15.7	15.7	13.5	13.5	15.6	14.5	14.5	16.7	11.8	11.8	14.0	10.7	10.7	11.5	13.0	12.7	13.1
9-Sep-08	7:00	10.6	10.6	14.9	11.5	11.5	14.2	13.9	13.9	15.0	11.2	11.2	14.5	11.2	11.2	15.1	9.2	9.2	12.9	9.2	9.2	10.8	10.9	10.9	12.9
10-Sep-08	7:00	9.8	9.8	13.3	9.8	9.8	12.9	9.2	9.2	14.0	10.6	10.6	12.9	10.6	10.6	13.2	9.8	9.8	11.6	8.4	8.4	9.9	9.5	9.5	12.0
12-Sep-08	15:00	8.9	8.9	11.1	8.7	8.7	10.8	8.1	8.1	12.3	9.2	9.2	11.6	8.7	8.7	11.8	8.9	8.9	10.2	8.9	8.9	9.3	8.9	8.9	11.1
13-Sep-08	14:00	7.8	7.8	10.7	8.1	8.1	10.5	7.8	7.8	11.3	8.1	8.1	10.8	8.9	8.9	10.9	7.8	7.8	9.7	7.8	7.8	9.2	8.4	8.4	10.7
14-Sep-08	14:00	8.4	8.4	9.0	8.4	8.4	9.0	7.8	7.8	8.8	8.1	8.1	9.4	6.9	6.9	9.3	8.4	8.4	8.9	7.5	7.5	8.4	7.2	7.2	9.9
15-Sep-08	14:00	7.2	7.2	8.8	7.2	7.2	8.8	7.2	7.2	8.5	7.2	7.2	9.1	7.2	7.2	8.9	6.9	6.9	8.7	7.2	7.2	8.2	7.5	7.5	8.7
16-Sep-08	14:00	6.9	6.9	8.6	7.2	7.2	8.6	6.9	6.9	8.3	7.2	7.2	8.8	7.2	7.2	8.7	6.9	6.9	8.4	7.2	7.2	8.1	7.2	7.2	8.5
17-Sep-08	14:00	6.6	6.6	7.6	6.9	6.9	7.7	6.3	6.3	7.4	6.9	6.9	7.7	7.2	7.2	7.6	7.2	7.2	7.6	6.9	6.9	7.5	6.6	6.6	7.6
18-Sep-08	14:00	6.9	6.9	7.5	6.6	6.6	7.6	6.6	6.6	7.2	6.9	6.9	7.6	6.9	6.9	7.5	6.9	6.9	7.5	6.6	6.6	7.4	7.2	7.2	7.5
19-Sep-08	14:00	6.6	6.6	7.2	6.2	6.2	7.2	6.2	6.2	7.0	6.2	6.2	7.2	6.8	6.8	7.2	6.8	6.8	7.3	6.7	6.7	7.1	6.1	6.1	7.1
20-Sep-08	14:00	NND	NND	7.2	6.2	6.2	7.1	6.2	6.2	6.9	6.5	6.4	7.1	6.8	6.8	7.2	NND	NND	7.3	NND	NND	7.1	6.1	6.1	6.9
21-Sep-08	20:00	5.8	5.8	6.8	5.9	5.9	6.8	5.3	5.3	6.5	5.9	5.9	6.8	5.8	5.8	6.9	5.1	5.1	6.8	5.7	5.7	6.8	5.6	5.6	6.7
23-Sep-08	16:00	6.7	6.7	6.4	6.0	6.0	6.2	5.6	5.6	5.9	5.9	5.9	6.3	6.2	6.2	6.5	6.2	6.2	6.2	5.9	5.9	6.2	5.6	5.6	6.1
25-Sep-08	20:00	5.7	5.7	6.3	6.1	6.1	6.0	6.2	6.2	5.8	5.1	5.1	5.9	5.4	5.4	6.1	5.8	5.8	5.9	5.2	5.2	5.8	4.9	4.9	5.6
27-Sep-08	19:00	NND	NND	6.3	NND	NND	6.0	NND	NND	5.8	NND	NND	5.9	NND	NND	6.1	NND	NND	5.9	NND	NND	5.8	NND	NND	5.6
28-Sep-08	22:00	NND	NND	6.3	NND	NND	6.0	NND	NND	5.8	NND	NND	5.9	NND	NND	6.1	NND	NND	5.9	NND	NND	5.8	NND	NND	5.6
29-Sep-08	20:00	NND	NND	NND	5.0	5.0	5.7	NND	NND	NND	NND	NND	NND	4.7	4.7	5.3	NND	NND	NND	4.9	4.9	5.2	4.8	4.8	5.0
30-Sep-08	23:30	4.9	4.9	5.6	5.0	5.0	5.6	4.6	4.6	5.6	4.6	4.6	5.0	4.7	4.5	5.2	4.7	4.7	5.5	4.9	4.9	5.2	4.8	4.7	4.9
2-Oct-08	21:00	4.4	4.4	5.1	4.5	4.5	5.2	4.0	4.0	5.1	4.3	4.3	4.7	4.0	4.0	4.7	4.8	4.8	5.1	4.6	4.6	5.0	3.9	3.9	4.6
3-Oct-08	20:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
4-Oct-08	20:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
5-Oct-08	21:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
6-Oct-08	21:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
7-Oct-08	20:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
8-Oct-08	20:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
9-Oct-08	18:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
10-Oct-08	21:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
11-Oct-08	20:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
12-Oct-08	21:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
13-Oct-08	18:00	NND	NND	NND	3.6	3.6	3.6	3.2	3.2	3.2	NND	NND	NND	3.5	3.5	3.5	3.3	3.3	3.3	3.3	3.3	3.3	3.4	3.4	3.4
14-Oct-08	20:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND
15-Oct-08	20:00	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND	NND

Notes:
1. TSS estimates (mg/L) were calculated from turbidity measurements using TSS-turbidity regression equations (see **Section 2.2.2** for details).
2. If a cell has "n/a" after the number, this means that sampling has not yet covered a period long enough to cover (24h or 7-d), but the average up to that date and time is still calculated
3. Red (or dark shade if b/w) cells are exceedances of relevant TSS thresholds for a particular station at a particular time; yellow (or light shade if b/w) cells highlight values approaching TSS triggers.
4. TSS Thresholds are as follows: (a) 24-h at HVH stations after Sept 1 = 25 (b) all other cases 24-h threshold = 50 (c) 7-d at HVH stations after Sept 1 = 6 (d) all other cases 7-d threshold = 15.
5. NND = no new data

APPENDIX C

DIKE MONITORING WATER QUALITY 2008 - LABORATORY REPORTS

Certificate of Analysis

AZIMUTH CONSULTING GROUP INC.

ATTN: RANDY BAKER

218 - 2902 WEST BROADWAY

VANCOUVER BC V6K 2G8

Reported On: 15-SEP-08 05:26 PM

Lab Work Order #: **L679134** **Date Received:** **05-SEP-08**

Project P.O. #:
Job Reference: DIKE CONSTRUCTION
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

NATASHA MARKOVIC-MIROVIC
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L679134-1	L679134-2	L679134-3		
	Description					
	Sampled Date	09-AUG-08	09-AUG-08	09-AUG-08		
	Sampled Time					
	Client ID	SE 2	SE 3	NE 2		
Grouping	**Analyte**					
WATER						
Plant Pigments	Chlorophyll a (ug)	0.496	0.407	0.484		

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
CHLOROA-VA	Water	Chlorophyll a by Fluorometer	APHA 10200 H. "Chlorophyll" and EPA 445

Chlorophyll and Pheopigments by Fluorometry analysis is carried out using procedures adapted from APHA Method 10200 H. "Chlorophyll" and USEPA Method 445. The sample is filtered using either a glass fiber filter or a 0.45 micron Membrane filter. The pigments are extracted from the filter with 90% aqueuos acetone. For chlorophyll a analysis the extract is read using a fluorometer. For pheopigments the extract is first acidified then read. This method is not subject to interferences from chlorophyll b.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

COC # ~~[illegible]~~

Page 1 of 1

REPORT TO:	REPORT FORMAT / DISTRIBUTION	SERVICE REQUESTED
COMPANY: AZIMUTH	STANDARD ___ OTHER ___	✓ REGULAR SERVICE (DEFAULT)
CONTACT: Randy Baker	PDF ✓ EXCEL ✓ CUSTOM ___ FAX ___	RUSH SERVICE (2-3 DAYS)
ADDRESS:	EMAIL 1: rbaker@azimuthgroup.ca.	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2:	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 604-730-1220 FAX:		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? (YES) / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	
COMPANY:	CLIENT / PROJECT INFORMATION:	
CONTACT:	JOB #: Dike Construction	
ADDRESS:	PO /AFE:	
	Legal Site Description:	
PHONE: FAX:	QUOTE #:	
Lab Work Order # (lab use only): L679134	SAMPLER (Initials):	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	Chlorophyll-a (mg)	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	SE 2	Aug. 9/08		Filter	X	N	N	1
	SE 3	"		"	X	N	N	1
	NE2	"		"	X	N	N	1

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

* These 3 filters were missing in a previous shipment. They were on COC form #s C098470, C098482, C098481. *

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
Maggie McConnell	Aug 23/08	HD	08/09/05 1057	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? (YES) / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	13	

REFER TO BACK PAGE FOR REGIONAL LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF14.00

Certificate of Analysis

AZIMUTH CONSULTING GROUP INC.

ATTN: RANDY BAKER

218 - 2902 WEST BROADWAY

VANCOUVER BC V6K 2G8

Reported On: 02-OCT-08 06:26 PM

Revision: 3

Lab Work Order #: L670707 **Date Received:** 18-AUG-08

Project P.O. #:
Job Reference:
Legal Site Desc:
CofC Numbers: C098470, C098481, C098482

Other Information:

Comments: ADDITIONAL 29-SEP-08 15:58 Please note the addition of conductivity and speciated alkalinity to the following samples: 1, 2, 3.

The detection limits for some metals analysis have been increased due to high levels of metals in the samples or interferences encountered during analysis.

Please note: chlorophyll A filters were not received with this submission.

Bryan Mark
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L670707-1	L670707-2	L670707-3		
	Description					
	Sampled Date	09-AUG-08	09-AUG-08	09-AUG-08		
	Sampled Time					
	Client ID	SE2	SE3	NE2		
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	22.2	23.0	21.9		
	Hardness (as CaCO3) (mg/L)	8.63	8.37	8.74		
	pH (pH)	8.14	7.82	6.46		
	Total Suspended Solids (mg/L)	4.9	7.4	3.9		
	Total Dissolved Solids (mg/L)	13	15	<10		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.1	6.8	7.4		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0	<2.0	<2.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0	<2.0	<2.0		
	Alkalinity, Total (as CaCO3) (mg/L)	6.1	6.8	7.4		
	Ammonia as N (mg/L)	0.0196	0.0158	0.0328		
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50		
	Nitrate (as N) (mg/L)	0.0137	0.0166	0.0120		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		
	Ortho Phosphate as P (mg/L)	<0.0010	<0.0010	<0.0010		
	Total Phosphate as P (mg/L)	0.0047	0.0074	0.0040		
	Silicate (as SIO2) (mg/L)	<1.0	<1.0	<1.0		
	Sulfate (SO4) (mg/L)	1.93	1.82	1.97		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.79	1.75	1.92		
	Total Organic Carbon (mg/L)	1.97	1.96	2.16		
Total Metals	Aluminum (Al)-Total (mg/L)	0.152	0.239	0.0871		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020		
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	<0.000017	<0.000017	<0.000017		
	Calcium (Ca)-Total (mg/L)	2.32	2.19	2.21		
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Total (mg/L)	<0.00030	<0.00030	<0.00030		
	Copper (Cu)-Total (mg/L)	0.0016	0.0014	<0.0030		
	Iron (Fe)-Total (mg/L)	0.166	0.289	0.118		
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Lithium (Li)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Magnesium (Mg)-Total (mg/L)	0.79	0.80	0.76		
	Manganese (Mn)-Total (mg/L)	0.00540	0.00842	0.00355		
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020	<0.000020		
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Nickel (Ni)-Total (mg/L)	<0.0010	<0.0010	<0.0010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L670707-1	L670707-2	L670707-3		
	Description					
	Sampled Date	09-AUG-08	09-AUG-08	09-AUG-08		
	Sampled Time					
	Client ID	SE2	SE3	NE2		
Grouping	**Analyte**					
WATER						
Total Metals	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0		
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020		
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0		
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	<0.010	0.012	<0.010		
	Uranium (U)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Vanadium (V)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0295	0.0512	0.0169		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Barium (Ba)-Dissolved (mg/L)	<0.020	<0.020	<0.020		
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	<0.000017	<0.000017	<0.000017		
	Calcium (Ca)-Dissolved (mg/L)	2.25	2.17	2.28		
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030		
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Iron (Fe)-Dissolved (mg/L)	0.032	0.055	<0.030		
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Lithium (Li)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Magnesium (Mg)-Dissolved (mg/L)	0.73	0.72	0.74		
	Manganese (Mn)-Dissolved (mg/L)	0.00244	0.00349	0.00162		
	Mercury (Hg)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0		
	Selenium (Se)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0		
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		
	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Qualifiers for Sample Submission Listed:

Qualifier	Description
NR:NR	No Result: Sample Not Received At Laboratory - ChloroA filters not received.

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	APHA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ALK-SCR-VA	Water	Alkalinity by colour or titration	EPA 310.2 OR APHA 2320

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
HG-DIS-CCME-CVAFS-VA	Water	Diss. Mercury in Water by CVAFS (CCME)	EPA 3005A/245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-CCME-CVAFS-VA	Water	Total Mercury in Water by CVAFS (CCME)	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-DIS-CCME-ICP-VA	Water	Diss. Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-CCME-MS-VA	Water	Diss. Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-CCME-ICP-VA	Water	Total Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA	Water	Total Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

NH3-COL-VA	Water	Ammonia by Color	APHA 4500-NH3 "Nitrogen (Ammonia)"

This analysis is carried out, on unpreserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using the phenate colourimetric method.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

PO4-DO-COL-VA	Water	Dissolved ortho Phosphate by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
PO4-T-COL-VA	Water	Total Phosphate P by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA	Water	Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

COC # C098481

Page ___ of ___

REPORT TO:
COMPANY: AZIMUTH GROUP
CONTACT: RANDY BAKER GARRY MANN
ADDRESS: 218-2902 W. Broadway
Vancouver, BC V6K 2G8
PHONE: 604-730-1220 FAX:

INVOICE TO: SAME AS REPORT ? (YES) / NO
COMPANY:
CONTACT:
ADDRESS:
PHONE: FAX:

REPORT FORMAT / DISTRIBUTION
STANDARD ___ OTHER ___
PDF ✓ EXCEL ✓ CUSTOM ___ FAX ___
EMAIL 1: RBAKER@AZIMUTHGROUP.CA
EMAIL 2: GMANN@AZIMUTHGROUP.CA

INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →

CLIENT / PROJECT INFORMATION:
JOB #:
PO /AFE:
Legal Site Description:
QUOTE #:
SAMPLER (Initials):

SERVICE REQUESTED
REGULAR SERVICE (DEFAULT) ✓
RUSH SERVICE (2-3 DAYS)
PRIORITY SERVICE (1 DAY or ASAP)
EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS

Lab Work Order # (lab use only): L670707

ANALYSIS REQUEST

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	CONVENTIONALS*	TOC (P)	DOC (F)	Total Metals (F)	Dissolved Metals (F/P)	Chlorophyll α (F/L)	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	SE2	AUG9/08		1L Plastic	✓								
	SE2			250 glass		✓							
	SE2			250 glass			✓						
	SE2			250 plastic				✓					
	SE2			250 plastic					✓				
	SE2			filterpaper						✓			

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
*pH, hardness, TDS, TSS, ANIONS + NUTRIENTS (NH4, alkalinity, Cl, Si, SO4, NO3, NO2, ortho, total P)

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:
James Aiken		[signature]	Aug 11/08 4:35
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:

SAMPLE CONDITION (lab use only)
TEMPERATURE: 13°C
SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

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COC # C098482

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REPORT TO:
COMPANY: AZIMUTH GROUP
CONTACT: RANDY BAKER GARRY MANN
ADDRESS: 218-2902 W. Broadway
Vancouver, BC V6K 2G8
PHONE: 604-730-1220 FAX:

REPORT FORMAT / DISTRIBUTION
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EMAIL 1: RBAKER@AZIMUTHGROUP.CA
EMAIL 2: GMANN@AZIMUTHGROUP.CA

SERVICE REQUESTED
REGULAR SERVICE (DEFAULT) ✓
RUSH SERVICE (2-3 DAYS)
PRIORITY SERVICE (1 DAY or ASAP)
EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS

INVOICE TO: SAME AS REPORT ? (YES) / NO
COMPANY:
CONTACT:
ADDRESS:
PHONE: FAX:

INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →

CLIENT / PROJECT INFORMATION:
JOB #:
PO /AFE:
Legal Site Description:
QUOTE #:

Lab Work Order # (lab use only): L670707

SAMPLER (Initials):

ANALYSIS REQUEST

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	CONVENTIONALS*	TOC (P)	DOC (F P)	Total Metals (P)	Dissolved Metals (F P)	Chlorophyl α	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	SE3	AUG 9/08		1L Plastic	✓								
	SE3			250 Glass		✓							
	SE3			250 Plastic				✓					
	SE3			250 Glass			✓						
	SE3			250 Plastic					✓				
	SE3			filter paper						✓			

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
*pH, hardness, TDS, TSS, ANIONS + NUTRIENTS (NH4, Alkalinity, Cl, Si, SO4, NO3, NO2, ortho P, total P

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
James Aiken		KI	[illegible]	TEMPERATURE: [illegible]	SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:		

REFER TO BACK PAGE FOR REGIONAL LOCATIONS AND SAMPLING INFORMATION

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

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COC # C098470

Page ____ of ____

REPORT TO:
COMPANY: Azimuth Group.
CONTACT: Randy Baker Gary Mann
ADDRESS: 218-2902 W. Broadway
Vancouver BC V6K 2G8
PHONE: 604. 730.1220 FAX:

INVOICE TO: SAME AS REPORT ? (YES) / NO
COMPANY:
CONTACT:
ADDRESS:
PHONE: FAX:

Lab Work Order # (lab use only): L670707

REPORT FORMAT / DISTRIBUTION
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EMAIL 1: RBAKER@AZIMUTHGROUP.CA
EMAIL 2: GMANN@AZIMUTHGROUP.CA

INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →

CLIENT / PROJECT INFORMATION:
JOB #:
PO /AFE:
Legal Site Description:
QUOTE #:

SAMPLER (Initials):

SERVICE REQUESTED
REGULAR SERVICE (DEFAULT) ✓
RUSH SERVICE (2-3 DAYS)
PRIORITY SERVICE (1 DAY or ASAP)
EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS

ANALYSIS REQUEST

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	CONVENTIONALS *	TOC	DOC	Total metals	Dissolved Metals	Chlorophyl α						HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
F/P						P	FP	P	FP									
	NE2	Aug 9/08		1 L Plastic	✓													
	NE2			250 glass		✓												
	NE2			250 glass			✓											
	NE2			250 plastic				✓										
	NE2			250 plastic					✓									
	NE2			filter paper						✓								

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS
* pH, hardness, TDS, TSS, Anions + Nutrients (NH4, alkalinity, Cl, Si, SO4, NO3, NO2, ortho P, total P

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.
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RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
James Aiken		AG	[illegible]	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	[illegible]	

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GENF14.00

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Certificate of Analysis

AZIMUTH CONSULTING GROUP INC.

ATTN: RANDY BAKER

218 - 2902 WEST BROADWAY

VANCOUVER BC V6K 2G8

Reported On: 02-OCT-08 12:40 PM
Revision: 2

Lab Work Order #: **L678879** **Date Received:** **05-SEP-08**

Project P.O. #:
Job Reference: DIKE CONSTRUCTION
Legal Site Desc:
CofC Numbers: C065403, C065405, C065406, C098460, C098461

Other Information:

Comments: ADDITIONAL 29-SEP-08 16:05 Please note the addition of sillicate analysis to samples: 1, 2, 3, 4, 19, 20, 21, 22, 23, 24.

For some of the submitted water samples, the measured concentration of specific dissolved parameters is greater than the corresponding total parameters concentration. The explanation for these findings is one or a combination of the following:
- laboratory method variability;
- field sampling method variability;
- bias introduced during general handling, storage, transportation and/or analysis of the sample;
- field sample grab bias - where separate grab samples are processed to produce total and dissolved samples;
- field sample split bias - where total and dissolved parameters samples are produced from the same grab sample.

For further clarification on any of the above information, please contact your ALS account manager.

Bryan Mark
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-1	L678879-2	L678879-3	L678879-4	L678879-5
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08
	Sampled Time					
	Client ID	SP-SE-2	SP-SE-3	SP-NE-1	SP-NE-3	SP-SE-2
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	24.1	23.8	24.4	23.6	
	Hardness (as CaCO3) (mg/L)					
	pH (pH)	7.27	7.24	7.28	7.24	
	Total Suspended Solids (mg/L)	26.2	28.2	40.7	20.7	
	Total Dissolved Solids (mg/L)	29	31	24	20	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	6.6	6.5	7.0	6.9	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Alkalinity, Total (as CaCO3) (mg/L)	6.6	6.5	7.0	6.9	
	Ammonia as N (mg/L)	0.031	0.034	0.036	0.039	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Nitrate (as N) (mg/L)	0.0242	0.0221	0.0381	0.0213	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.150	0.138	0.133	0.162	
	Ortho Phosphate as P (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Phosphate as P (mg/L)	0.037	0.528	0.045	0.026	
	Silicate (as SIO2) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Sulfate (SO4) (mg/L)	2.23	2.22	2.20	2.20	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.06	2.04	2.19	1.88	
	Total Organic Carbon (mg/L)	1.37	1.51	1.49	1.41	
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-6	L678879-7	L678879-8	L678879-9	L678879-10
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08		
	Sampled Time					
	Client ID	SP-SE-3	SP-NE-1	SP-NE-3	TRAVEL BLANK OCT 7	TRAVEL BLANK NOV 1
WATER						
Physical Tests	Conductivity (uS/cm)				<2.0	<2.0
	Hardness (as CaCO3) (mg/L)				<0.70	<0.70
	pH (pH)				5.71	5.68
	Total Suspended Solids (mg/L)				<3.0	<3.0
	Total Dissolved Solids (mg/L)				<10	<10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)				<2.0	<2.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)				<2.0	<2.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)				<2.0	<2.0
	Alkalinity, Total (as CaCO3) (mg/L)				<2.0	<2.0
	Ammonia as N (mg/L)				<0.020	0.027
	Chloride (Cl) (mg/L)				<0.50	<0.50
	Nitrate (as N) (mg/L)				<0.0050	<0.0050
	Nitrite (as N) (mg/L)				<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)				<0.050	<0.050
	Ortho Phosphate as P (mg/L)				<0.0010	<0.0010
	Total Phosphate as P (mg/L)				<0.0020	<0.0020
	Silicate (as SIO2) (mg/L)					
	Sulfate (SO4) (mg/L)				<0.50	<0.50
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)				<0.50	
	Total Organic Carbon (mg/L)					<0.50
Total Metals	Aluminum (Al)-Total (mg/L)				<0.0050	<0.0050
	Antimony (Sb)-Total (mg/L)				<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)				<0.00050	<0.00050
	Barium (Ba)-Total (mg/L)				<0.020	<0.020
	Beryllium (Be)-Total (mg/L)				<0.0010	<0.0010
	Boron (B)-Total (mg/L)				<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)				<0.000017	<0.000017
	Calcium (Ca)-Total (mg/L)				<0.10	<0.10
	Chromium (Cr)-Total (mg/L)				<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)				<0.00030	<0.00030
	Copper (Cu)-Total (mg/L)				<0.0010	<0.0010
	Iron (Fe)-Total (mg/L)				<0.030	<0.030
	Lead (Pb)-Total (mg/L)				<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)				<0.0050	<0.0050
	Magnesium (Mg)-Total (mg/L)				<0.10	<0.10
	Manganese (Mn)-Total (mg/L)				<0.00030	<0.00030
	Mercury (Hg)-Total (mg/L)				<0.000020	<0.000020
	Molybdenum (Mo)-Total (mg/L)				<0.0010	<0.0010

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-11	L678879-12	L678879-13	L678879-14	L678879-15
	Sample ID	L678879-11	L678879-12	L678879-13	L678879-14	L678879-15
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08
	Sampled Time					
	Client ID	SP-SE-2-D	SP-SE-3-D	SP-NE-1-D	SP-NE-3-D	SP-SE-2-T
WATER						
Physical Tests	Conductivity (uS/cm)					
	Hardness (as CaCO3) (mg/L)	9.77	10.0	10.6	9.80	13.8
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)					
	Alkalinity, Hydroxide (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)					
	Ammonia as N (mg/L)					
	Chloride (Cl) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
	Total Kjeldahl Nitrogen (mg/L)					
	Ortho Phosphate as P (mg/L)					
	Total Phosphate as P (mg/L)					
	Silicate (as SIO2) (mg/L)					
	Sulfate (SO4) (mg/L)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)					1.94
	Antimony (Sb)-Total (mg/L)					<0.00050
	Arsenic (As)-Total (mg/L)					0.00072
	Barium (Ba)-Total (mg/L)					0.020
	Beryllium (Be)-Total (mg/L)					<0.0010
	Boron (B)-Total (mg/L)					<0.10
	Cadmium (Cd)-Total (mg/L)					<0.000017
	Calcium (Ca)-Total (mg/L)					2.82
	Chromium (Cr)-Total (mg/L)					0.0067
	Cobalt (Co)-Total (mg/L)					0.00114
	Copper (Cu)-Total (mg/L)					0.0039
	Iron (Fe)-Total (mg/L)					2.47
	Lead (Pb)-Total (mg/L)					0.00156
	Lithium (Li)-Total (mg/L)					<0.0050
	Magnesium (Mg)-Total (mg/L)					1.64
	Manganese (Mn)-Total (mg/L)					0.0438
	Mercury (Hg)-Total (mg/L)					<0.000020
	Molybdenum (Mo)-Total (mg/L)					<0.0010

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-16	L678879-17	L678879-18	L678879-19	L678879-20
	Sample ID	L678879-16	L678879-17	L678879-18	L678879-19	L678879-20
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-SE-3-T	SP-NE-1-T	SP-NE-3-T	SP-E214-SF	SP-E214-DP
WATER						
Physical Tests	Conductivity (uS/cm)				24.4	40.6
	Hardness (as CaCO3) (mg/L)	12.5	15.2	11.3		
	pH (pH)				7.28	7.64
	Total Suspended Solids (mg/L)				17.2	378
	Total Dissolved Solids (mg/L)				20	95
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)				7.8	17.1
	Alkalinity, Carbonate (as CaCO3) (mg/L)				<2.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)				<2.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)				7.8	17.1
	Ammonia as N (mg/L)				<0.020	0.184
	Chloride (Cl) (mg/L)				<0.50	0.52
	Nitrate (as N) (mg/L)				0.0265	0.0794
	Nitrite (as N) (mg/L)				<0.0010	0.0056
	Total Kjeldahl Nitrogen (mg/L)				0.086	0.612
	Ortho Phosphate as P (mg/L)				<0.0010	0.0063
	Total Phosphate as P (mg/L)				0.034	0.40
	Silicate (as SIO2) (mg/L)				<1.0	1.1
	Sulfate (SO4) (mg/L)				2.26	2.42
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)				1.63	1.44
	Total Organic Carbon (mg/L)				1.40	5.46
Total Metals	Aluminum (Al)-Total (mg/L)	1.36	2.33	0.976		
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Arsenic (As)-Total (mg/L)	0.00071	0.00100	0.00051		
	Barium (Ba)-Total (mg/L)	<0.020	0.022	<0.020		
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	<0.000017	0.000019	<0.000017		
	Calcium (Ca)-Total (mg/L)	2.72	3.04	2.58		
	Chromium (Cr)-Total (mg/L)	0.0050	0.0089	0.0037		
	Cobalt (Co)-Total (mg/L)	0.00092	0.00140	0.00063		
	Copper (Cu)-Total (mg/L)	0.0038	0.0053	0.0030		
	Iron (Fe)-Total (mg/L)	1.90	2.82	1.29		
	Lead (Pb)-Total (mg/L)	0.00150	0.00176	0.00090		
	Lithium (Li)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Magnesium (Mg)-Total (mg/L)	1.39	1.85	1.19		
	Manganese (Mn)-Total (mg/L)	0.0397	0.0509	0.0249		
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020	<0.000020		
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010		

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-21	L678879-22	L678879-23	L678879-24	L678879-25
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-A3-SF	SP-A3-DP	SP-2	SP-3	SP-E214-SF-D
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	23.8	24.7	23.7	24.6	
	Hardness (as CaCO3) (mg/L)					10.3
	pH (pH)	7.29	7.32	7.29	7.31	
	Total Suspended Solids (mg/L)	13.2	21.2	10.7	23.7	
	Total Dissolved Solids (mg/L)	30	31	22	17	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.5	7.6	6.5	7.6	
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Alkalinity, Total (as CaCO3) (mg/L)	7.5	7.6	6.5	7.6	
	Ammonia as N (mg/L)	0.046	0.028	0.070	0.031	
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	
	Nitrate (as N) (mg/L)	0.0233	0.0282	0.0188	0.0280	
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)	0.121	0.222	0.228	0.235	
	Ortho Phosphate as P (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Total Phosphate as P (mg/L)	0.026	0.034	0.0129	0.0028	
	Silicate (as SIO2) (mg/L)	<1.0	<1.0	<1.0	<1.0	
	Sulfate (SO4) (mg/L)	2.24	2.25	2.25	2.18	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.52	1.55			
	Total Organic Carbon (mg/L)	1.63	1.41	1.65	1.69	
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-26	L678879-27	L678879-28	L678879-29	L678879-30
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-E214-DP-D	SP-A3-SF-D	SP-A3-DP-D	SP-2-D	SP-3-D
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)					
	Hardness (as CaCO3) (mg/L)	18.6	9.88	10.6	9.65	9.98
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)					
	Alkalinity, Hydroxide (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)					
	Ammonia as N (mg/L)					
	Chloride (Cl) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
	Total Kjeldahl Nitrogen (mg/L)					
	Ortho Phosphate as P (mg/L)					
	Total Phosphate as P (mg/L)					
	Silicate (as SIO2) (mg/L)					
	Sulfate (SO4) (mg/L)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-31	L678879-32	L678879-33	L678879-34	L678879-35
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-E214-SF-T	SP-E214-DP-T	SP-A3-SF-T	SP-A3-DP-T	SP-2-T
WATER						
Physical Tests	Conductivity (uS/cm)					
	Hardness (as CaCO3) (mg/L)	13.0	71.6	12.7	15.8	11.0
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)					
	Alkalinity, Hydroxide (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)					
	Ammonia as N (mg/L)					
	Chloride (Cl) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
	Total Kjeldahl Nitrogen (mg/L)					
	Ortho Phosphate as P (mg/L)					
	Total Phosphate as P (mg/L)					
	Silicate (as SIO2) (mg/L)					
	Sulfate (SO4) (mg/L)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)	1.50	25.9	1.37	2.82	0.688
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	0.00071	0.0109	0.00063	0.00120	<0.00050
	Barium (Ba)-Total (mg/L)	<0.020	0.209	<0.020	0.027	<0.020
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.000017	0.000173	<0.000017	0.000020	<0.000017
	Calcium (Ca)-Total (mg/L)	2.84	8.41	2.80	3.15	2.61
	Chromium (Cr)-Total (mg/L)	0.0060	0.0941	0.0053	0.0101	0.0023
	Cobalt (Co)-Total (mg/L)	0.00094	0.0139	0.00079	0.00149	0.00043
	Copper (Cu)-Total (mg/L)	0.0039	0.0411	0.0034	0.0055	0.0021
	Iron (Fe)-Total (mg/L)	1.81	30.2	1.60	3.01	0.892
	Lead (Pb)-Total (mg/L)	0.00124	0.0166	0.00102	0.00178	0.00066
	Lithium (Li)-Total (mg/L)	<0.0050	0.041	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Total (mg/L)	1.44	12.3	1.38	1.94	1.08
	Manganese (Mn)-Total (mg/L)	0.0335	0.455	0.0291	0.0501	0.0179
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-36	L678879-37	L678879-38	L678879-39	L678879-40
	Sample ID	L678879-36	L678879-37	L678879-38	L678879-39	L678879-40
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-3-T	SP-E214-SF	SP-E214-DP	SP-A3-SF	SP-A3-DP
WATER						
Physical Tests	Conductivity (uS/cm)					
	Hardness (as CaCO3) (mg/L)	13.2				
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)					
	Alkalinity, Hydroxide (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)					
	Ammonia as N (mg/L)					
	Chloride (Cl) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
	Total Kjeldahl Nitrogen (mg/L)					
	Ortho Phosphate as P (mg/L)					
	Total Phosphate as P (mg/L)					
	Silicate (as SIO2) (mg/L)					
	Sulfate (SO4) (mg/L)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)	1.63				
	Antimony (Sb)-Total (mg/L)	<0.00050				
	Arsenic (As)-Total (mg/L)	0.00077				
	Barium (Ba)-Total (mg/L)	<0.020				
	Beryllium (Be)-Total (mg/L)	<0.0010				
	Boron (B)-Total (mg/L)	<0.10				
	Cadmium (Cd)-Total (mg/L)	<0.000017				
	Calcium (Ca)-Total (mg/L)	2.85				
	Chromium (Cr)-Total (mg/L)	0.0057				
	Cobalt (Co)-Total (mg/L)	0.00095				
	Copper (Cu)-Total (mg/L)	0.0037				
	Iron (Fe)-Total (mg/L)	1.88				
	Lead (Pb)-Total (mg/L)	0.00120				
	Lithium (Li)-Total (mg/L)	<0.0050				
	Magnesium (Mg)-Total (mg/L)	1.47				
	Manganese (Mn)-Total (mg/L)	0.0336				
	Mercury (Hg)-Total (mg/L)	<0.000020				
	Molybdenum (Mo)-Total (mg/L)	<0.0010				

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L678879-41 22-AUG-08 SP-2	L678879-42 22-AUG-08 SP-3			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)					
	Hardness (as CaCO3) (mg/L)					
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)					
	Alkalinity, Hydroxide (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)					
	Ammonia as N (mg/L)					
	Chloride (Cl) (mg/L)					
	Nitrate (as N) (mg/L)					
	Nitrite (as N) (mg/L)					
	Total Kjeldahl Nitrogen (mg/L)					
	Ortho Phosphate as P (mg/L)					
	Total Phosphate as P (mg/L)					
	Silicate (as SIO2) (mg/L)					
	Sulfate (SO4) (mg/L)					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-1	L678879-2	L678879-3	L678879-4	L678879-5
	Sample ID	L678879-1	L678879-2	L678879-3	L678879-4	L678879-5
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08
	Sampled Time					
	Client ID	SP-SE-2	SP-SE-3	SP-NE-1	SP-NE-3	SP-SE-2
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-6	L678879-7	L678879-8	L678879-9	L678879-10
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08		
	Sampled Time					
	Client ID	SP-SE-3	SP-NE-1	SP-NE-3	TRAVEL BLANK OCT 7	TRAVEL BLANK NOV 1
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)				<0.0010	<0.0010
	Potassium (K)-Total (mg/L)				<2.0	<2.0
	Selenium (Se)-Total (mg/L)				<0.0010	<0.0010
	Silver (Ag)-Total (mg/L)				<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)				<2.0	<2.0
	Thallium (Tl)-Total (mg/L)				<0.00020	<0.00020
	Tin (Sn)-Total (mg/L)				<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)				<0.010	<0.010
	Uranium (U)-Total (mg/L)				<0.00020	<0.00020
	Vanadium (V)-Total (mg/L)				<0.0010	<0.0010
	Zinc (Zn)-Total (mg/L)				<0.0050	<0.0050
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-11	L678879-12	L678879-13	L678879-14	L678879-15
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08
	Sampled Time					
	Client ID	SP-SE-2-D	SP-SE-3-D	SP-NE-1-D	SP-NE-3-D	SP-SE-2-T
Grouping	**Analyte**					
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)					0.0042
	Potassium (K)-Total (mg/L)					<2.0
	Selenium (Se)-Total (mg/L)					<0.0010
	Silver (Ag)-Total (mg/L)					0.000021
	Sodium (Na)-Total (mg/L)					<2.0
	Thallium (Tl)-Total (mg/L)					<0.00020
	Tin (Sn)-Total (mg/L)					<0.00050
	Titanium (Ti)-Total (mg/L)					0.102
	Uranium (U)-Total (mg/L)					0.00105
	Vanadium (V)-Total (mg/L)					0.0035
	Zinc (Zn)-Total (mg/L)					0.0081
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0979	0.152	0.204	0.112	
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Barium (Ba)-Dissolved (mg/L)	<0.020	<0.020	<0.020	<0.020	
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Dissolved (mg/L)	<0.000017	<0.000017	<0.000017	<0.000017	
	Calcium (Ca)-Dissolved (mg/L)	2.59	2.60	2.78	2.51	
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Copper (Cu)-Dissolved (mg/L)	<0.0010	0.0012	0.0013	<0.0010	
	Iron (Fe)-Dissolved (mg/L)	0.147	0.253	0.335	0.152	
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Lithium (Li)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Magnesium (Mg)-Dissolved (mg/L)	0.80	0.86	0.88	0.86	
	Manganese (Mn)-Dissolved (mg/L)	0.00900	0.0101	0.0133	0.00654	
	Mercury (Hg)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Selenium (Se)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Tin (Sn)-Dissolved (mg/L)	<0.00050	0.00434	0.00273	<0.00050	
	Titanium (Ti)-Dissolved (mg/L)	<0.010	0.011	0.015	<0.010	
	Uranium (U)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-16	L678879-17	L678879-18	L678879-19	L678879-20
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-SE-3-T	SP-NE-1-T	SP-NE-3-T	SP-E214-SF	SP-E214-DP
Grouping	**Analyte**					
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)	0.0035	0.0056	0.0030		
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0		
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020		
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0		
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050		
	Titanium (Ti)-Total (mg/L)	0.074	0.111	0.050		
	Uranium (U)-Total (mg/L)	0.00102	0.00099	0.00052		
	Vanadium (V)-Total (mg/L)	0.0028	0.0041	0.0018		
	Zinc (Zn)-Total (mg/L)	0.0081	0.0090	0.0061		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-21	L678879-22	L678879-23	L678879-24	L678879-25
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-A3-SF	SP-A3-DP	SP-2	SP-3	SP-E214-SF-D
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					0.0068
	Antimony (Sb)-Dissolved (mg/L)					<0.00050
	Arsenic (As)-Dissolved (mg/L)					<0.00050
	Barium (Ba)-Dissolved (mg/L)					<0.020
	Beryllium (Be)-Dissolved (mg/L)					<0.0010
	Boron (B)-Dissolved (mg/L)					<0.10
	Cadmium (Cd)-Dissolved (mg/L)					<0.000017
	Calcium (Ca)-Dissolved (mg/L)					2.85
	Chromium (Cr)-Dissolved (mg/L)					<0.0010
	Cobalt (Co)-Dissolved (mg/L)					<0.00030
	Copper (Cu)-Dissolved (mg/L)					<0.0010
	Iron (Fe)-Dissolved (mg/L)					<0.030
	Lead (Pb)-Dissolved (mg/L)					<0.00050
	Lithium (Li)-Dissolved (mg/L)					<0.0050
	Magnesium (Mg)-Dissolved (mg/L)					0.78
	Manganese (Mn)-Dissolved (mg/L)					0.00335
	Mercury (Hg)-Dissolved (mg/L)					<0.000020
	Molybdenum (Mo)-Dissolved (mg/L)					<0.0010
	Nickel (Ni)-Dissolved (mg/L)					<0.0010
	Potassium (K)-Dissolved (mg/L)					<2.0
	Selenium (Se)-Dissolved (mg/L)					<0.0010
	Silver (Ag)-Dissolved (mg/L)					<0.000020
	Sodium (Na)-Dissolved (mg/L)					<2.0
	Thallium (Tl)-Dissolved (mg/L)					<0.00020
	Tin (Sn)-Dissolved (mg/L)					<0.00050
	Titanium (Ti)-Dissolved (mg/L)					<0.010
	Uranium (U)-Dissolved (mg/L)					<0.00020
	Vanadium (V)-Dissolved (mg/L)					<0.0010

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-26	L678879-27	L678879-28	L678879-29	L678879-30
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-E214-DP-D	SP-A3-SF-D	SP-A3-DP-D	SP-2-D	SP-3-D
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0199	0.0097	<0.0050	0.0337	0.0354
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.00065	<0.00050	<0.00050	<0.00050	<0.00050
	Barium (Ba)-Dissolved (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017
	Calcium (Ca)-Dissolved (mg/L)	5.70	2.67	2.90	2.56	2.72
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	0.031	0.031
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Dissolved (mg/L)	1.05	0.78	0.81	0.79	0.77
	Manganese (Mn)-Dissolved (mg/L)	0.0123	0.00242	0.00527	0.00152	0.00375
	Mercury (Hg)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Molybdenum (Mo)-Dissolved (mg/L)	0.0013	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silver (Ag)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00142	<0.00020	<0.00020	<0.00020	<0.00020
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-31	L678879-32	L678879-33	L678879-34	L678879-35
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-E214-SF-T	SP-E214-DP-T	SP-A3-SF-T	SP-A3-DP-T	SP-2-T
Grouping	**Analyte**					
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)	0.0037	0.0559	0.0032	0.0059	0.0018
	Potassium (K)-Total (mg/L)	<2.0	9.7	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010
	Silver (Ag)-Total (mg/L)	<0.000020	0.00024	<0.000020	0.000028	<0.000020
	Sodium (Na)-Total (mg/L)	<2.0	3.0	<2.0	<2.0	<2.0
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Total (mg/L)	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	0.078	1.21	0.065	0.129	0.035
	Uranium (U)-Total (mg/L)	0.00076	0.0114	0.00066	0.00113	0.00044
	Vanadium (V)-Total (mg/L)	0.0026	0.0404	0.0023	0.0044	0.0013
	Zinc (Zn)-Total (mg/L)	0.0063	0.0789	0.0060	0.0084	<0.0050
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-36	L678879-37	L678879-38	L678879-39	L678879-40
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-3-T	SP-E214-SF	SP-E214-DP	SP-A3-SF	SP-A3-DP
Grouping	**Analyte**					
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)	0.0038				
	Potassium (K)-Total (mg/L)	<2.0				
	Selenium (Se)-Total (mg/L)	<0.0010				
	Silver (Ag)-Total (mg/L)	0.000022				
	Sodium (Na)-Total (mg/L)	<2.0				
	Thallium (Tl)-Total (mg/L)	<0.00020				
	Tin (Sn)-Total (mg/L)	<0.00050				
	Titanium (Ti)-Total (mg/L)	0.077				
	Uranium (U)-Total (mg/L)	0.00074				
	Vanadium (V)-Total (mg/L)	0.0028				
	Zinc (Zn)-Total (mg/L)	0.0063				
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L678879-41	L678879-42			
	Description					
	Sampled Date	22-AUG-08	22-AUG-08			
	Sampled Time					
	Client ID	SP-2	SP-3			
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-1	L678879-2	L678879-3	L678879-4	L678879-5
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08
	Sampled Time					
	Client ID	SP-SE-2	SP-SE-3	SP-NE-1	SP-NE-3	SP-SE-2
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					
Plant Pigments	Chlorophyll a (ug)					0.290
	Chlorophyll a (ug/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-6	L678879-7	L678879-8	L678879-9	L678879-10
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08		
	Sampled Time					
	Client ID	SP-SE-3	SP-NE-1	SP-NE-3	TRAVEL BLANK OCT 7	TRAVEL BLANK NOV 1
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					
Plant Pigments	Chlorophyll a (ug)	0.281	0.249	0.235		
	Chlorophyll a (ug/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-11	L678879-12	L678879-13	L678879-14	L678879-15
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08	16-AUG-08
	Sampled Time					
	Client ID	SP-SE-2-D	SP-SE-3-D	SP-NE-1-D	SP-NE-3-D	SP-SE-2-T
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Plant Pigments	Chlorophyll a (ug)					
	Chlorophyll a (ug/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-16	L678879-17	L678879-18	L678879-19	L678879-20
	Description					
	Sampled Date	16-AUG-08	16-AUG-08	16-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-SE-3-T	SP-NE-1-T	SP-NE-3-T	SP-E214-SF	SP-E214-DP
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					
Plant Pigments	Chlorophyll a (ug)					
	Chlorophyll a (ug/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-21	L678879-22	L678879-23	L678879-24	L678879-25
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-A3-SF	SP-A3-DP	SP-2	SP-3	SP-E214-SF-D
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					<0.0050
Plant Pigments	Chlorophyll a (ug)					
	Chlorophyll a (ug/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-26	L678879-27	L678879-28	L678879-29	L678879-30
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-E214-DP-D	SP-A3-SF-D	SP-A3-DP-D	SP-2-D	SP-3-D
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Plant Pigments	Chlorophyll a (ug)					
	Chlorophyll a (ug/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-31	L678879-32	L678879-33	L678879-34	L678879-35
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-E214-SF-T	SP-E214-DP-T	SP-A3-SF-T	SP-A3-DP-T	SP-2-T
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					
Plant Pigments	Chlorophyll a (ug)					
	Chlorophyll a (ug/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678879-36	L678879-37	L678879-38	L678879-39	L678879-40
	Sample ID	L678879-36	L678879-37	L678879-38	L678879-39	L678879-40
	Description					
	Sampled Date	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08	22-AUG-08
	Sampled Time					
	Client ID	SP-3-T	SP-E214-SF	SP-E214-DP	SP-A3-SF	SP-A3-DP
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					
Plant Pigments	Chlorophyll a (ug)		0.107		0.130	0.135
	Chlorophyll a (ug/L)			0.758		

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678879-41	L678879-42			
	Description					
	Sampled Date	22-AUG-08	22-AUG-08			
	Sampled Time					
	Client ID	SP-2	SP-3			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					
Plant Pigments	Chlorophyll a (ug)	0.112				
	Chlorophyll a (ug/L)		0.534			

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 "Alkalinity"

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALK-SCR-VA	Water	Alkalinity by colour or titration	EPA 310.2 OR APHA 2320

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-VA	Water	Chlorophyll a by Fluorometer	APHA 10200 H. "Chlorophyll" and EPA 445

Chlorophyll and Pheopigments by Fluorometry analysis is carried out using procedures adapted from APHA Method 10200 H. "Chlorophyll" and USEPA Method 445. The sample is filtered using either a glass fiber filter or a 0.45 micron Membrane filter. The pigments are extracted from the filter with 90% aqueuos acetone. For chlorophyll a analysis the extract is read using a fluorometer. For pheopigments the extract is first acidified then read. This method is not subject to interferences from chlorophyll b.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-DIS-CCME-CVAFS-VA	Water	Diss. Mercury in Water by CVAFS (CCME)	EPA 3005A/245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-CCME-CVAFS-VA	Water	Total Mercury in Water by CVAFS (CCME)	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-DIS-CCME-ICP-VA	Water	Diss. Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-CCME-MS-VA	Water	Diss. Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-CCME-ICP-VA	Water	Total Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA	Water	Total Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

NH3-SIE-VA	Water	Ammonia by SIE	APHA 4500-NH3 "Nitrogen (Ammonia)"

This analysis is carried out, on sulphuric acid preserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using an ammonia selective electrode.

PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
PO4-DO-COL-VA	Water	Dissolved ortho Phosphate by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-T-COL-VA	Water	Total Phosphate P by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-SIE-VA	Water	Total Kjeldahl Nitrogen by SIE	APHA 4500-Norg (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total kjeldahl nitrogen is determined by sample digestion at 367 celcius with analysis using an ammonia selective electrode.

TSS-VA	Water	Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

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Page 1 of 5

REPORT TO:	REPORT FORMAT / DISTRIBUTION	SERVICE REQUESTED
COMPANY: AZIMUTH GROUP	STANDARD ____ OTHER ____	✓ REGULAR SERVICE (DEFAULT)
CONTACT: Rady Baker	PDF ✓ EXCEL ✓ CUSTOM ____ FAX ____	RUSH SERVICE (2-3 DAYS)
ADDRESS: 218-2902 W. Broadway, Vancouver, BC, V6K 2G8	EMAIL 1: rbaker@azimuthgroup.ca	PRIORITY SERVICE (1 DAY or ASAP)
PHONE: 604-730-1220 FAX:	EMAIL 2: mmcconnell@azimuthgroup.ca	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
INVOICE TO: SAME AS REPORT ? (YES) / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	ANALYSIS REQUEST
COMPANY:	CLIENT / PROJECT INFORMATION:	
CONTACT:	JOB #: Dike Construction	
ADDRESS:	PO / AFE:	
	Legal Site Description:	
PHONE: FAX:	QUOTE #: ALSEQ-07-622	
Lab Work Order # (lab use only): L678879	SAMPLER (Initials): DH, KM	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	Conventionals*	TOC (+HCl)	DOC (+HCl)	TKN, Ammonia (+H2SO4)	Total Metals (+HNO3)	Chlorophyll-a (+MgCO3)	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	(F/P)					P	F, P	P	P	P			
	SP-SE-2	Aug. 16/08		Water	X	X	X	X			N	N	4
	SP-SE-3	"		"	X	X	X	X					4
	SP-NE-1	"		"	X	X	X	X					4
	SP-NE-3	"		"	X	X	X	X					4
	SP-SE-2	"		Filter						X			1
	SP-SE-3	"		"						X			1
	SP-NE-1	"		"						X			1
	SP-NE-3	"		"						X			1
	Travel Blank (Dike Construction)	Oct. 7/08		Water	X		X	X	X				4
	Travel Blank (Dike Construction)	Nov. 1/08		Water	X	X		X	X				4

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

*Conventionals: conductivity, hardness, pH, TSS, TDS, nutrients (nitrate, nitrite, ~~total phosphate~~ orthophosphate), sulphate, chloride, alkalinity (bicarbonate, carbonate, hydroxide)

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

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RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
Maggie McConnell	Aug. 23/08	HD 08/09/05	10:58	TEMPERATURE: 13	SAMPLES RECEIVED IN GOOD CONDITION? (YES) / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:		

REFER TO BACK PAGE FOR REGIONAL LOCATIONS AND SAMPLING INFORMATION

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REPORT TO:	REPORT FORMAT / DISTRIBUTION	SERVICE REQUESTED
COMPANY: See	STANDARD ___ OTHER ___	✓ REGULAR SERVICE (DEFAULT)
CONTACT: Page	PDF ___ EXCEL ___ CUSTOM ___ FAX ___	RUSH SERVICE (2-3 DAYS)
ADDRESS:	EMAIL 1:	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2:	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: FAX:		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? YES / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	P / F P
COMPANY:	CLIENT / PROJECT INFORMATION:	
CONTACT:	JOB #: Dike Construction	
ADDRESS:	PO /AFE:	
	Legal Site Description:	
PHONE: FAX:	QUOTE #: ALSEQ-07-1622	
Lab Work Order # (lab use only)	SAMPLER (Initials):	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	Total Metals (HNO3)	Total Metals (F-HNO3)	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	SP-SE-2-D	Aug 14/08		Water		X	N	N	1
	SP-SE-3-D	↓		↓		X	↓	↓	1
	SP-NE-1-D	↓		↓		X	↓	↓	1
	SP-NE-3-D	↓		↓		X	↓	↓	1
	SP-SE-2-T	↓		↓	X		↓	↓	1
	SP-SE-3-T	↓		↓	X		↓	↓	1
	SP-NE-1-T	↓		↓	X		↓	↓	1
	SP-NE-3-T	↓		↓	X		↓	↓	1

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

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RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
Maggie McConnell	Aug. 23/08	HD 08/09/05	10:58	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? (YES) / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	13	

REFER TO BACK PAGE FOR REGIONAL LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

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Page 3 of 5

REPORT TO:	REPORT FORMAT / DISTRIBUTION	
COMPANY: See Page 1	STANDARD ____ OTHER ____	
CONTACT:	PDF ____ EXCEL ____ CUSTOM ____ FAX ____	✓ RUSH SERVICE (2-3 DAYS) (For TSS - 1L).
ADDRESS:	EMAIL 1:	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2:	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: FAX:		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? YES / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	
COMPANY:	CLIENT / PROJECT INFORMATION:	
CONTACT:	JOB #: Dike Construction	
ADDRESS:	PO /AFE:	
	Legal Site Description:	
PHONE: FAX:	QUOTE #:	
Lab Work Order # (lab use only)	SAMPLER (Initials):	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	Conventionals*	TSS (1L)	TKN, Ammonia (+H2SO4) P	TOC (+HCl) P	DOC (+HCl) F P		Total Metals (+HNO3) P	Total Metals (+HNO3) F P				HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	SP-E214-SF	Aug. 22/08		Water	X	X	X	X	X							N	N	5
	SP-E214-DP	↓		↓	X	X	X	X	X							↓	↓	5
	SP-A3-SF				X	X	X	X	X									5
	SP-A3-DP				X	X	X	X	X									5
	SP-2				X	X	X	X										4
	SP-3				X	X	X	X										4
	SP-E214-SF-D											X						1
	SP-E214-DP-D											X						1
	SP-A3-SF-D											X						1
	SP-A3-DP-D											X						1

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

*Conventionals - see Page 1 for complete list.

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

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RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
Maggie McConnell	Aug. 23/08	HD 08/08/05	10:58	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? YES / NO (if no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	13	

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Page 4 of 5

REPORT TO:
COMPANY:
CONTACT: See Page 1
ADDRESS:
PHONE: FAX:

REPORT FORMAT / DISTRIBUTION
STANDARD ____ OTHER ____
PDF ____ EXCEL ____ CUSTOM ____ FAX ____
EMAIL 1:
EMAIL 2:

SERVICE REQUESTED
✓ REGULAR SERVICE (DEFAULT)
RUSH SERVICE (2-3 DAYS)
PRIORITY SERVICE (1 DAY or ASAP)
EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS

INVOICE TO: SAME AS REPORT ? YES / NO
COMPANY:
CONTACT:
ADDRESS:
PHONE: FAX:

INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →

CLIENT / PROJECT INFORMATION:
JOB #: Dike Construction
PO /AFE:
Legal Site Description:
QUOTE #: ALSEQ-07-622

Lab Work Order # (lab use only)

SAMPLER (Initials):

ANALYSIS REQUEST

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	Total Metals (HNO3) (P)	Total Metals/Diss (HNO3) (F P)	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	SP-2-D	Aug. 22/08		Water		X	N	N	1
	SP-3-D	↓		↓		X	↓	↓	1
	SP-E214-SF-T	↓		↓	X		↓	↓	1
	SP-E214-DP-T	↓		↓	X		↓	↓	1
	SP-193-SF-T	↓		↓	X		↓	↓	1
	SP-193-DP-T	↓		↓	X		↓	↓	1
	SP-2-T	↓		↓	X		↓	↓	1
	SP-3-T	↓		↓	X		↓	↓	1

GUIDELINES / REGULATIONS

SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

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RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
Maggie McConnell	Aug. 23/08	HD 08/09/05	1059	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? (YES) / NO (If no provide details)
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	13	

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COC # C065403

REPORT TO:	REPORT FORMAT / DISTRIBUTION	SERVICE REQUESTED
COMPANY: See	STANDARD ____ OTHER ____	✓ REGULAR SERVICE (DEFAULT)
CONTACT: Page 1	PDF ____ EXCEL ____ CUSTOM ____ FAX ____	RUSH SERVICE (2-3 DAYS)
ADDRESS:	EMAIL 1:	PRIORITY SERVICE (1 DAY or ASAP)
	EMAIL 2:	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: FAX:		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? YES / NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →	P
COMPANY:	CLIENT / PROJECT INFORMATION:	
CONTACT:	JOB #: Dike Construction	
ADDRESS:	PO / AFE:	
	Legal Site Description:	
PHONE: FAX:	QUOTE #: ALSEQ-07-1022.	
Lab Work Order # (lab use only)	SAMPLER (Initials):	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	Chlorophyll-a (mg/L)											HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	SP-E214-SF	Aug.22/08		Filter	X											N	N	1
	SP-E214-DP	↓		↓	X											↓	↓	↓
	SP-A3-SF	↓		↓	X											↓	↓	↓
	SP-A3-DP	↓		↓	X											↓	↓	↓
	SP-2	↓		↓	X											↓	↓	↓
	SP-3	↓		↓	X											↓	↓	↓

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

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RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
Maggie McConnell	Aug.23/08	HD 08/08/05	10:59	TEMPERATURE 13	SAMPLES RECEIVED IN GOOD CONDITION? YES / NO (If no provide details) — YES circled
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:		

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Certificate of Analysis

AZIMUTH CONSULTING GROUP INC.

ATTN: GARY MANN

218 - 2902 WEST BROADWAY

VANCOUVER BC V6K 2G8

Reported On: 11-SEP-08 05:27 PM

Lab Work Order #: **L678945** **Date Received:** **06-SEP-08**

Project P.O. #:
Job Reference: AEM-08-01.2 MEADOWBANK EAST DIKE MONITORING
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

NATASHA MARKOVIC-MIROVIC
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678945-1	L678945-2	L678945-3	L678945-4	L678945-5
	Description					
	Sampled Date	02-SEP-08	02-SEP-08	02-SEP-08	02-SEP-08	02-SEP-08
	Sampled Time	15:00	15:00	15:30	15:30	16:00
	Client ID	WQ-E214-090208-S	WQ-E214-090208-S	WQ-E214-090208-D	WQ-E214-090208-D	WQ-201-090208 S
WATER						
Physical Tests	Conductivity (uS/cm)	25.7		25.7		24.5
	Hardness (as CaCO3) (mg/L)	10.7		11.7		10.2
	pH (pH)	7.26		7.28		7.27
	Total Suspended Solids (mg/L)	11.2		10.7		6.2
	Total Dissolved Solids (mg/L)	27		25		24
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.4		7.3		6.6
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0		<2.0		<2.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0		<2.0		<2.0
	Alkalinity, Total (as CaCO3) (mg/L)	7.4		7.3		6.6
	Ammonia as N (mg/L)	0.028		0.025		<0.020
	Chloride (Cl) (mg/L)	<0.50		0.51		<0.50
	Nitrate (as N) (mg/L)	0.0439		0.0420		0.0251
	Nitrite (as N) (mg/L)	<0.0010		<0.0010		<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.218		0.247		0.177
	Ortho Phosphate as P (mg/L)	0.0011		<0.0010		<0.0010
	Total Phosphate as P (mg/L)	0.0179		0.0182		0.0122
	Silicate (as SIO2) (mg/L)	<1.0		<1.0		<1.0
	Sulfate (SO4) (mg/L)	2.17		2.13		2.26
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.96		4.00		2.12
	Total Organic Carbon (mg/L)	2.11		1.83		1.79
Total Metals	Aluminum (Al)-Total (mg/L)	0.977		0.955		0.701
	Antimony (Sb)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Arsenic (As)-Total (mg/L)	0.00054		0.00053		<0.00050
	Barium (Ba)-Total (mg/L)	<0.020		<0.020		<0.020
	Beryllium (Be)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Boron (B)-Total (mg/L)	<0.10		<0.10		<0.10
	Cadmium (Cd)-Total (mg/L)	<0.000017		<0.000017		<0.000017
	Calcium (Ca)-Total (mg/L)	3.04		2.82		2.72
	Chromium (Cr)-Total (mg/L)	0.0034		0.0034		0.0022
	Cobalt (Co)-Total (mg/L)	0.00055		0.00056		0.00037
	Copper (Cu)-Total (mg/L)	0.0029		0.0029		0.0023
	Iron (Fe)-Total (mg/L)	1.12		1.07		0.785
	Lead (Pb)-Total (mg/L)	0.00080		0.00078		0.00059
	Lithium (Li)-Total (mg/L)	<0.0050		<0.0050		<0.0050
	Magnesium (Mg)-Total (mg/L)	1.27		1.20		1.07
	Manganese (Mn)-Total (mg/L)	0.0215		0.0209		0.0138
	Mercury (Hg)-Total (mg/L)	<0.000020		<0.000020		<0.000020
	Molybdenum (Mo)-Total (mg/L)	<0.0010		<0.0010		<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678945-6	L678945-7	L678945-8	L678945-9	L678945-10
	Description					
	Sampled Date	02-SEP-08	03-SEP-08	03-SEP-08	03-SEP-08	03-SEP-08
	Sampled Time	16:00	09:10	09:10	09:30	09:30
	Client ID	WQ-201-090208 S	WQ-A3-090208 S	WQ-A3-090208 S	WQ-A3-090208 D	WQ-A3-090208 D
WATER						
Physical Tests	Conductivity (uS/cm)		28.3		28.6	
	Hardness (as CaCO3) (mg/L)		11.6		11.7	
	pH (pH)		7.34		7.33	
	Total Suspended Solids (mg/L)		15.2		12.7	
	Total Dissolved Solids (mg/L)		23		32	
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)		8.2		8.6	
	Alkalinity, Carbonate (as CaCO3) (mg/L)		<2.0		<2.0	
	Alkalinity, Hydroxide (as CaCO3) (mg/L)		<2.0		<2.0	
	Alkalinity, Total (as CaCO3) (mg/L)		8.2		8.6	
	Ammonia as N (mg/L)		0.026		0.029	
	Chloride (Cl) (mg/L)		0.52		0.57	
	Nitrate (as N) (mg/L)		0.0623		0.0634	
	Nitrite (as N) (mg/L)		0.0013		0.0012	
	Total Kjeldahl Nitrogen (mg/L)		0.137		0.189	
	Ortho Phosphate as P (mg/L)		0.0010		<0.0010	
	Total Phosphate as P (mg/L)		0.0208		0.0235	
	Silicate (as SIO2) (mg/L)		<1.0		<1.0	
	Sulfate (SO4) (mg/L)		2.27		2.28	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)		1.73		2.12	
	Total Organic Carbon (mg/L)		1.91		1.82	
Total Metals	Aluminum (Al)-Total (mg/L)		1.18		0.994	
	Antimony (Sb)-Total (mg/L)		<0.00050		<0.00050	
	Arsenic (As)-Total (mg/L)		0.00069		0.00061	
	Barium (Ba)-Total (mg/L)		<0.020		<0.020	
	Beryllium (Be)-Total (mg/L)		<0.0010		<0.0010	
	Boron (B)-Total (mg/L)		<0.10		<0.10	
	Cadmium (Cd)-Total (mg/L)		<0.000017		<0.000017	
	Calcium (Ca)-Total (mg/L)		3.32		3.20	
	Chromium (Cr)-Total (mg/L)		0.0041		0.0034	
	Cobalt (Co)-Total (mg/L)		0.00070		0.00060	
	Copper (Cu)-Total (mg/L)		0.0039		0.0032	
	Iron (Fe)-Total (mg/L)		1.35		1.13	
	Lead (Pb)-Total (mg/L)		0.00150		0.00093	
	Lithium (Li)-Total (mg/L)		<0.0050		<0.0050	
	Magnesium (Mg)-Total (mg/L)		1.40		1.28	
	Manganese (Mn)-Total (mg/L)		0.0257		0.0227	
	Mercury (Hg)-Total (mg/L)		<0.000020		<0.000020	
	Molybdenum (Mo)-Total (mg/L)		<0.0010		<0.0010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678945-11	L678945-12	L678945-13	L678945-14	L678945-15
	Description					
	Sampled Date	03-SEP-08	03-SEP-08			
	Sampled Time	10:00	10:00			
	Client ID	WQ-E203-090208 S	WQ-E203-090208 S	WQ-090208-DUP	WQ-090208-DUP	ALS TRAVEL BLANKS BATCH
WATER						
Physical Tests	Conductivity (uS/cm)	25.5		29.4		<2.0
	Hardness (as CaCO3) (mg/L)	10.5		12.7		<0.70
	pH (pH)	7.29		7.35		5.65
	Total Suspended Solids (mg/L)	8.2		9.7		<3.0
	Total Dissolved Solids (mg/L)	25		28		<10
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	7.6		8.4		<2.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0		<2.0		<2.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0		<2.0		<2.0
	Alkalinity, Total (as CaCO3) (mg/L)	7.6		8.4		<2.0
	Ammonia as N (mg/L)	0.021		0.030		<0.020
	Chloride (Cl) (mg/L)	0.51		0.66		<0.50
	Nitrate (as N) (mg/L)	0.0269		0.0626		<0.0050
	Nitrite (as N) (mg/L)	<0.0010		0.0013		<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.153		0.221		<0.050
	Ortho Phosphate as P (mg/L)	<0.0010		0.0010		<0.0010
	Total Phosphate as P (mg/L)	0.0148		0.0237		<0.0020
	Silicate (as SIO2) (mg/L)	<1.0		<1.0		<1.0
	Sulfate (SO4) (mg/L)	2.34		2.28		<0.50
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.86		2.14		
	Total Organic Carbon (mg/L)	1.67		2.13		<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.589		1.37		<0.0050
	Antimony (Sb)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Arsenic (As)-Total (mg/L)	<0.00050		0.00070		<0.00050
	Barium (Ba)-Total (mg/L)	<0.020		<0.020		<0.020
	Beryllium (Be)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Boron (B)-Total (mg/L)	<0.10		<0.10		<0.10
	Cadmium (Cd)-Total (mg/L)	<0.000017		<0.000017		<0.000017
	Calcium (Ca)-Total (mg/L)	2.89		3.22		<0.10
	Chromium (Cr)-Total (mg/L)	0.0019		0.0046		<0.0010
	Cobalt (Co)-Total (mg/L)	0.00034		0.00072		<0.00030
	Copper (Cu)-Total (mg/L)	0.0024		0.0036		<0.0010
	Iron (Fe)-Total (mg/L)	0.669		1.48		<0.030
	Lead (Pb)-Total (mg/L)	0.00084		0.00099		<0.00050
	Lithium (Li)-Total (mg/L)	<0.0050		<0.0050		<0.0050
	Magnesium (Mg)-Total (mg/L)	1.06		1.44		<0.10
	Manganese (Mn)-Total (mg/L)	0.0138		0.0261		<0.00030
	Mercury (Hg)-Total (mg/L)	<0.000020		<0.000020		<0.000020
	Molybdenum (Mo)-Total (mg/L)	<0.0010		<0.0010		<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678945-1	L678945-2	L678945-3	L678945-4	L678945-5
	Sample ID	L678945-1	L678945-2	L678945-3	L678945-4	L678945-5
	Description					
	Sampled Date	02-SEP-08	02-SEP-08	02-SEP-08	02-SEP-08	02-SEP-08
	Sampled Time	15:00	15:00	15:30	15:30	16:00
	Client ID	WQ-E214-090208-S	WQ-E214-090208-S	WQ-E214-090208-D	WQ-E214-090208-D	WQ-201-090208 S
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)	0.0025		0.0025		0.0018
	Potassium (K)-Total (mg/L)	<2.0		<2.0		<2.0
	Selenium (Se)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Silver (Ag)-Total (mg/L)	0.000023		<0.000020		<0.000020
	Sodium (Na)-Total (mg/L)	<2.0		<2.0		<2.0
	Thallium (Tl)-Total (mg/L)	<0.00020		<0.00020		<0.00020
	Tin (Sn)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Titanium (Ti)-Total (mg/L)	0.042		0.039		0.030
	Uranium (U)-Total (mg/L)	0.00040		0.00039		0.00037
	Vanadium (V)-Total (mg/L)	0.0017		0.0016		0.0011
	Zinc (Zn)-Total (mg/L)	0.0053		0.0065		<0.0050
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0345		0.0289		0.0179
	Antimony (Sb)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Barium (Ba)-Dissolved (mg/L)	<0.020		<0.020		<0.020
	Beryllium (Be)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Boron (B)-Dissolved (mg/L)	<0.10		<0.10		<0.10
	Cadmium (Cd)-Dissolved (mg/L)	<0.000017		<0.000017		<0.000017
	Calcium (Ca)-Dissolved (mg/L)	2.95		3.24		2.76
	Chromium (Cr)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030		<0.00030		<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010		0.0012		<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030		<0.030		<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.0050		<0.0050		<0.0050
	Magnesium (Mg)-Dissolved (mg/L)	0.81		0.87		0.81
	Manganese (Mn)-Dissolved (mg/L)	0.00417		0.00378		0.00123
	Mercury (Hg)-Dissolved (mg/L)	<0.000020		<0.000020		<0.000020
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Nickel (Ni)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Potassium (K)-Dissolved (mg/L)	<2.0		<2.0		<2.0
	Selenium (Se)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Silver (Ag)-Dissolved (mg/L)	<0.000020		<0.000020		<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0		2.2		<2.0
	Thallium (Tl)-Dissolved (mg/L)	<0.00020		<0.00020		<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010		<0.010		<0.010
	Uranium (U)-Dissolved (mg/L)	<0.00020		<0.00020		<0.00020
	Vanadium (V)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678945-6	L678945-7	L678945-8	L678945-9	L678945-10
	Description					
	Sampled Date	02-SEP-08	03-SEP-08	03-SEP-08	03-SEP-08	03-SEP-08
	Sampled Time	16:00	09:10	09:10	09:30	09:30
	Client ID	WQ-201-090208 S	WQ-A3-090208 S	WQ-A3-090208 S	WQ-A3-090208 D	WQ-A3-090208 D
Grouping	**Analyte**					
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)		0.0031		0.0026	
	Potassium (K)-Total (mg/L)		<2.0		<2.0	
	Selenium (Se)-Total (mg/L)		<0.0010		<0.0010	
	Silver (Ag)-Total (mg/L)		<0.000020		<0.000020	
	Sodium (Na)-Total (mg/L)		<2.0		<2.0	
	Thallium (Tl)-Total (mg/L)		<0.00020		<0.00020	
	Tin (Sn)-Total (mg/L)		<0.00050		<0.00050	
	Titanium (Ti)-Total (mg/L)		0.048		0.042	
	Uranium (U)-Total (mg/L)		0.00050		0.00046	
	Vanadium (V)-Total (mg/L)		0.0020		0.0017	
	Zinc (Zn)-Total (mg/L)		0.0077		0.0076	
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)		0.0465		0.0751	
	Antimony (Sb)-Dissolved (mg/L)		<0.00050		<0.00050	
	Arsenic (As)-Dissolved (mg/L)		<0.00050		<0.00050	
	Barium (Ba)-Dissolved (mg/L)		<0.020		<0.020	
	Beryllium (Be)-Dissolved (mg/L)		<0.0010		<0.0010	
	Boron (B)-Dissolved (mg/L)		<0.10		<0.10	
	Cadmium (Cd)-Dissolved (mg/L)		<0.000017		<0.000017	
	Calcium (Ca)-Dissolved (mg/L)		3.24		3.26	
	Chromium (Cr)-Dissolved (mg/L)		<0.0010		<0.0010	
	Cobalt (Co)-Dissolved (mg/L)		<0.00030		<0.00030	
	Copper (Cu)-Dissolved (mg/L)		<0.0010		<0.0010	
	Iron (Fe)-Dissolved (mg/L)		0.035		0.057	
	Lead (Pb)-Dissolved (mg/L)		<0.00050		<0.00050	
	Lithium (Li)-Dissolved (mg/L)		<0.0050		<0.0050	
	Magnesium (Mg)-Dissolved (mg/L)		0.85		0.86	
	Manganese (Mn)-Dissolved (mg/L)		0.00393		0.00435	
	Mercury (Hg)-Dissolved (mg/L)		<0.000020		<0.000020	
	Molybdenum (Mo)-Dissolved (mg/L)		<0.0010		<0.0010	
	Nickel (Ni)-Dissolved (mg/L)		<0.0010		<0.0010	
	Potassium (K)-Dissolved (mg/L)		<2.0		<2.0	
	Selenium (Se)-Dissolved (mg/L)		<0.0010		<0.0010	
	Silver (Ag)-Dissolved (mg/L)		<0.000020		<0.000020	
	Sodium (Na)-Dissolved (mg/L)		<2.0		<2.0	
	Thallium (Tl)-Dissolved (mg/L)		<0.00020		<0.00020	
	Tin (Sn)-Dissolved (mg/L)		<0.00050		<0.00050	
	Titanium (Ti)-Dissolved (mg/L)		<0.010		<0.010	
	Uranium (U)-Dissolved (mg/L)		<0.00020		<0.00020	
	Vanadium (V)-Dissolved (mg/L)		<0.0010		<0.0010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L678945-11	L678945-12	L678945-13	L678945-14	L678945-15
	Description					
	Sampled Date	03-SEP-08	03-SEP-08			
	Sampled Time	10:00	10:00			
	Client ID	WQ-E203-090208 S	WQ-E203-090208 S	WQ-090208-DUP	WQ-090208-DUP	ALS TRAVEL BLANKS BATCH
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)	0.0017		0.0034		<0.0010
	Potassium (K)-Total (mg/L)	<2.0		<2.0		<2.0
	Selenium (Se)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Silver (Ag)-Total (mg/L)	<0.000020		<0.000020		<0.000020
	Sodium (Na)-Total (mg/L)	<2.0		<2.0		<2.0
	Thallium (Tl)-Total (mg/L)	<0.00020		<0.00020		<0.00020
	Tin (Sn)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Titanium (Ti)-Total (mg/L)	0.026		0.058		<0.010
	Uranium (U)-Total (mg/L)	0.00038		0.00049		<0.00020
	Vanadium (V)-Total (mg/L)	<0.0010		0.0023		<0.0010
	Zinc (Zn)-Total (mg/L)	0.0057		0.0082		<0.0050
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0160		0.0651		
	Antimony (Sb)-Dissolved (mg/L)	<0.00050		<0.00050		
	Arsenic (As)-Dissolved (mg/L)	<0.00050		<0.00050		
	Barium (Ba)-Dissolved (mg/L)	<0.020		<0.020		
	Beryllium (Be)-Dissolved (mg/L)	<0.0010		<0.0010		
	Boron (B)-Dissolved (mg/L)	<0.10		<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	<0.000017		<0.000017		
	Calcium (Ca)-Dissolved (mg/L)	2.85		3.57		
	Chromium (Cr)-Dissolved (mg/L)	<0.0010		<0.0010		
	Cobalt (Co)-Dissolved (mg/L)	<0.00030		<0.00030		
	Copper (Cu)-Dissolved (mg/L)	<0.0010		0.0010		
	Iron (Fe)-Dissolved (mg/L)	<0.030		0.053		
	Lead (Pb)-Dissolved (mg/L)	<0.00050		<0.00050		
	Lithium (Li)-Dissolved (mg/L)	<0.0050		<0.0050		
	Magnesium (Mg)-Dissolved (mg/L)	0.83		0.93		
	Manganese (Mn)-Dissolved (mg/L)	0.00106		0.00430		
	Mercury (Hg)-Dissolved (mg/L)	<0.000020		<0.000020		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010		<0.0010		
	Nickel (Ni)-Dissolved (mg/L)	<0.0010		<0.0010		
	Potassium (K)-Dissolved (mg/L)	<2.0		<2.0		
	Selenium (Se)-Dissolved (mg/L)	<0.0010		<0.0010		
	Silver (Ag)-Dissolved (mg/L)	<0.000020		<0.000020		
	Sodium (Na)-Dissolved (mg/L)	<2.0		<2.0		
	Thallium (Tl)-Dissolved (mg/L)	<0.00020		<0.00020		
	Tin (Sn)-Dissolved (mg/L)	<0.00050		<0.00050		
	Titanium (Ti)-Dissolved (mg/L)	<0.010		<0.010		
	Uranium (U)-Dissolved (mg/L)	<0.00020		<0.00020		
	Vanadium (V)-Dissolved (mg/L)	<0.0010		<0.0010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678945-1	L678945-2	L678945-3	L678945-4	L678945-5
	Description					
	Sampled Date	02-SEP-08	02-SEP-08	02-SEP-08	02-SEP-08	02-SEP-08
	Sampled Time	15:00	15:00	15:30	15:30	16:00
	Client ID	WQ-E214-090208-S	WQ-E214-090208-S	WQ-E214-090208-D	WQ-E214-090208-D	WQ-201-090208 S
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)	<0.0050		0.0081		<0.0050
Plant Pigments	Chlorophyll a (ug)		0.263			
	Chlorophyll a (ug/L)				0.230	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L678945-6	L678945-7	L678945-8	L678945-9	L678945-10
	Description					
	Sampled Date	02-SEP-08	03-SEP-08	03-SEP-08	03-SEP-08	03-SEP-08
	Sampled Time	16:00	09:10	09:10	09:30	09:30
	Client ID	WQ-201-090208 S	WQ-A3-090208 S	WQ-A3-090208 S	WQ-A3-090208 D	WQ-A3-090208 D
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)		<0.0050		<0.0050	
Plant Pigments	Chlorophyll a (ug)			0.225		0.214
	Chlorophyll a (ug/L)	0.508				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

		L678945-11	L678945-12	L678945-13	L678945-14	L678945-15
	Sample ID	L678945-11	L678945-12	L678945-13	L678945-14	L678945-15
	Description					
	Sampled Date	03-SEP-08	03-SEP-08			
	Sampled Time	10:00	10:00			
	Client ID	WQ-E203-090208 S	WQ-E203-090208 S	WQ-090208-DUP	WQ-090208-DUP	ALS TRAVEL BLANKS BATCH
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)	<0.0050		0.0074		
Plant Pigments	Chlorophyll a (ug)		0.275		0.250	
	Chlorophyll a (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-SCR-VA	Water	Alkalinity by colour or titration	EPA 310.2 OR APHA 2320

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-VA	Water	Chlorophyll a by Fluorometer	APHA 10200 H. "Chlorophyll" and EPA 445

Chlorophyll and Pheopigments by Fluorometry analysis is carried out using procedures adapted from APHA Method 10200 H. "Chlorophyll" and USEPA Method 445. The sample is filtered using either a glass fiber filter or a 0.45 micron Membrane filter. The pigments are extracted from the filter with 90% aqueuos acetone. For chlorophyll a analysis the extract is read using a fluorometer. For pheopigments the extract is first acidified then read. This method is not subject to interferences from chlorophyll b.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-DIS-CCME-CVAFS-VA	Water	Diss. Mercury in Water by CVAFS (CCME)	EPA 3005A/245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)

analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-CCME-CVAFS-VA	Water	Total Mercury in Water by CVAFS (CCME)	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-DIS-CCME-ICP-VA	Water	Diss. Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-CCME-MS-VA	Water	Diss. Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-CCME-ICP-VA	Water	Total Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA	Water	Total Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

NH3-SIE-VA	Water	Ammonia by SIE	APHA 4500-NH3 "Nitrogen (Ammonia)"

This analysis is carried out, on sulphuric acid preserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using an ammonia selective electrode.

PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

PO4-DO-COL-VA	Water	Dissolved ortho Phosphate by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
PO4-T-COL-VA	Water	Total Phosphate P by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
TKN-SIE-VA	Water	Total Kjeldahl Nitrogen by SIE	APHA 4500-Norg (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total kjeldahl nitrogen is determined by sample digestion at 367 celcius with analysis using an ammonia selective electrode.

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
TSS-VA	Water	Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES
Environmental Division

Chain of Custody / Analytical Req **Canada Toll Free: 1 800 668 9878**
www.alsglobal.com

RUSH
equires priority processing

Azimuth-04-Sep-08

Report to:		**Report Format / Distribution**		**Service Requested:**
Company:	Azimuth Consulting Group Inc	☐ Standard ☐ Other		☐ Regular Service (Default)
Contact:	Gary Mann	☑ PDF ☑ Excel ☐ Fax		☑ Rush Service (2-3 Days)
Address:	218 - 2902 West Broadway, Vancouver, BC	Email 1:	rhill@azimuthgroup.ca	☐ Priority Service (1 Day or ASAP)
		Email 2:	gmann@azimuthgroup.ca	☐ Emergency Service (<1 Day / Wkend) - Contact ALS
Phone:	604-730-1220 Fax:			**Analysis Request**
Invoice To:	☑ Same as Report	Indicate Bottles: Filtered / Preserved (F/P) →		
Company:		**Client / Project Information:**		
Contact:		Job #:	AEM-08-01.2 Meadowbank East Dike Monitoring	
Address:		PO/AFE:		
Sample		Legal Site Description:		
Phone:	Fax:	Quote #:		
Lab Work Order # (lab use only)	L678945	**ALS Contact:**	**Sampler** (Initials):	

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Time hh:mm	Sample Type (Select from drop-down list)	General	COD/NH3/TKN (preserved H2	TOC (preserved HCl)	DOC (field filtered, pres. HCl)	Total metals (preserved HNO3	D-metals (field filtered; pres. H	Chlorophyll a	Hazardous?	Highly Contaminated?	Number of Containers
				F/P →		P	P	F/P	P	F/P				
	WQ-E214-090208-S	02-Sep-08	15:00	Water	X	X	X	X	X	X				
	WQ-E214-090208-S (this is a filter in tinfoil)	02-Sep-08	15:00	Other							X			
	WQ-E214-090208-D	02-Sep-08	15:30	Water	X	X	X	X	X	X				
	WQ-E214-090208-D (this is a filter in tinfoil)	02-Sep-08	15:30	Other							X			
	WQ-E201-090208-S	02-Sep-08	16:00	Water	X	X	X	X	X	X				
	WQ-E201-090208-S (this is a filter in tinfoil)	02-Sep-08	16:00	Other							X			
	WQ-A3-090208-S	03-Sep-08	9:10	Water	X	X	X	X	X	X				
	WQ-A3-090208-S (this is a filter in tinfoil)	03-Sep-08	9:10	Other							X			
	WQ-A3-090208-D	03-Sep-08	9:30	Water	X	X	X	X	X	X				
	WQ-A3-090208-D (this is a filter in tinfoil)	03-Sep-08	9:30	Other							X			

Guidelines / Regulations	**Special Instructions / Hazardous Details**
	Attention: please consult Natasha Markovic-Mirovic.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

Relinquished By:	Date & Time:	Received By:	Date & Time:	Sample Condition (lab use only)	
Ryan Hill [signature]	Sept 4/08 12:30	ZH	Sept 6,08 11:34	Temperature: 11	Samples Received in Good Condition? Y / N (if no provided details)
Relinquished By:	Date & Time:	Received By:	Date & Time:		

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES
Environmental Division

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # Azimuth-04-Sep-08

Report to:		Report Format / Distribution		Service Requested:	
Company:	Azimuth Consulting Group Inc	☐ Standard ☐ Other		☐	Regular Service (Default)
Contact:	Gary Mann	☑ PDF ☑ Excel ☐ Fax		☑	Rush Service (2-3 Days)
Address:	218 - 2902 West Broadway, Vancouver, BC	Email 1:	rhill@azimuthgroup.ca	☐	Priority Service (1 Day or ASAP)
		Email 2:	gmann@azimuthgroup.ca	☐	Emergency Service (<1 Day / Wkend) - Contact ALS
Phone:	604-730-1220 Fax:				
Invoice To:	☑ Same as Report		Indicate Bottles: Filtered / Preserved (F/P) →		
Company:		Client / Project Information:			
Contact:		Job #:	AEM-08-01.2 Meadowbank East Dike Monitoring		
Address:		PO/AFE:			
Sample		Legal Site Description:			
Phone:	Fax:	Quote #:			
Lab Work Order # (lab use only)		ALS Contact:	Sampler (Initials):		

Analysis Request

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Time hh:mm	Sample Type (Select from drop-down list)	General	COD/NH3/TKN (preserved H2	TOC (preserved HCl)	DOC (field filtered, pres. HCl)	Total metals (preserved HNO3	D-metals (field filtered; pres. H	Chlorophyll a				Hazardous?	Highly Contaminated?	Number of Containers
	Indicate Bottles: F/P					P	P	F/P	P	F/P							
	WQ-E203-090208-S	03-Sep-08	10:00	Water	X	X	X	X	X	X							
	WQ-E203-090208-S (this is a filter in tinfoil)	03-Sep-08	10:00	Other							X						
	WQ-090208-DUP	03-Sep-08	morning	Water	X	X	X	X	X	X							
	WQ-090208-DUP (this is a filter in tinfoil)	03-Sep-08	morning	Other							X						
	ALS Travel Blanks batch 080825			Water	X	X	X		X								

Guidelines / Regulations	Special Instructions / Hazardous Details
	Attention: please consult Natasha Markovic-Mirovic.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

Relinquished By:	Ryan Hill	Date & Time:	Sept 4/08 12:30	Received By:	ZN	Date & Time:	Sept 6,08 11:35	Sample Condition (lab use only)	
Relinquished By:		Date & Time:		Received By:		Date & Time:		Temperature: 11	Samples Received in Good Condition? Y / N (if no provided details)

Certificate of Analysis

AZIMUTH CONSULTING GROUP INC.

ATTN: RANDY BAKER

218 - 2902 WEST BROADWAY

VANCOUVER BC V6K 2G8

Reported On: 28-OCT-08 11:41 AM

Lab Work Order #: L687277 **Date Received:** 24-SEP-08

Project P.O. #:
Job Reference: DIKE CONSTRUCTION
Legal Site Desc:
CofC Numbers:

Other Information:

Comments:

Bryan Mark
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L687277-1	L687277-2	L687277-3	L687277-4	L687277-5
	Description					
	Sampled Date	12-SEP-08	12-SEP-08	12-SEP-08	12-SEP-08	12-SEP-08
	Sampled Time					
	Client ID	SP-NE1	SP-NE1	SP-SE2	SP-SE2	SP-SE3
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	26.5		26.8		26.5
	Hardness (as CaCO3) (mg/L)	11.1		11.2		11.1
	pH (pH)	7.26		7.27		7.29
	Total Suspended Solids (mg/L)			26.2		<3.0
	Total Dissolved Solids (mg/L)	22		17		17
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	8.0		8.5		8.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0		<2.0		<2.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0		<2.0		<2.0
	Alkalinity, Total (as CaCO3) (mg/L)	8.0		8.5		8.3
	Ammonia as N (mg/L)	0.028		<0.020		<0.020
	Chloride (Cl) (mg/L)	<0.50		<0.50		<0.50
	Nitrate (as N) (mg/L)	0.0352		0.0356		0.0350
	Nitrite (as N) (mg/L)	<0.0010		<0.0010		0.0012
	Total Kjeldahl Nitrogen (mg/L)	0.093		0.089		0.089
	Ortho Phosphate as P (mg/L)	0.0012		0.0011		0.0013
	Total Phosphate as P (mg/L)	0.0087		0.0080		0.0082
	Silicate (as SIO2) (mg/L)	<1.0		<1.0		<1.0
	Sulfate (SO4) (mg/L)	2.09		2.05		2.05
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	1.84		1.74		1.80
	Total Organic Carbon (mg/L)	1.77		1.74		1.72
Total Metals	Aluminum (Al)-Total (mg/L)	0.443		0.361		0.454
	Antimony (Sb)-Total (mg/L)	0.00062		<0.00050		<0.00050
	Arsenic (As)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Barium (Ba)-Total (mg/L)	<0.020		<0.020		<0.020
	Beryllium (Be)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Boron (B)-Total (mg/L)	<0.10		<0.10		<0.10
	Cadmium (Cd)-Total (mg/L)	<0.000017		<0.000017		<0.000017
	Calcium (Ca)-Total (mg/L)	2.88		2.96		2.89
	Chromium (Cr)-Total (mg/L)	0.0014		0.0011		0.0014
	Cobalt (Co)-Total (mg/L)	<0.00030		<0.00030		<0.00030
	Copper (Cu)-Total (mg/L)	0.0019		0.0018		0.0019
	Iron (Fe)-Total (mg/L)	0.558		0.457		0.552
	Lead (Pb)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Lithium (Li)-Total (mg/L)	<0.0050		<0.0050		<0.0050
	Magnesium (Mg)-Total (mg/L)	1.01		0.96		1.00
	Manganese (Mn)-Total (mg/L)	0.0101		0.00969		0.0106
	Mercury (Hg)-Total (mg/L)	<0.000020		<0.000020		<0.000020
	Molybdenum (Mo)-Total (mg/L)	<0.0010		<0.0010		<0.0010

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L687277-6	L687277-7			
	Description					
	Sampled Date	12-SEP-08	25-AUG-08			
	Sampled Time					
	Client ID	SP-SE3	TRAVEL BLANK (DIKE CONST)			
WATER						
Physical Tests	Conductivity (uS/cm)		<2.0			
	Hardness (as CaCO3) (mg/L)		<0.70			
	pH (pH)		5.54			
	Total Suspended Solids (mg/L)		<3.0			
	Total Dissolved Solids (mg/L)		<10			
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)		<2.0			
	Alkalinity, Carbonate (as CaCO3) (mg/L)		<2.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)		<2.0			
	Alkalinity, Total (as CaCO3) (mg/L)		<2.0			
	Ammonia as N (mg/L)		<0.020			
	Chloride (Cl) (mg/L)		<0.50			
	Nitrate (as N) (mg/L)		<0.0050			
	Nitrite (as N) (mg/L)		<0.0010			
	Total Kjeldahl Nitrogen (mg/L)		<0.050			
	Ortho Phosphate as P (mg/L)		<0.0010			
	Total Phosphate as P (mg/L)		<0.0020			
	Silicate (as SIO2) (mg/L)		<1.0			
	Sulfate (SO4) (mg/L)		<0.50			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)					
	Total Organic Carbon (mg/L)		<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)		<0.0050			
	Antimony (Sb)-Total (mg/L)		<0.00050			
	Arsenic (As)-Total (mg/L)		<0.00050			
	Barium (Ba)-Total (mg/L)		<0.020			
	Beryllium (Be)-Total (mg/L)		<0.0010			
	Boron (B)-Total (mg/L)		<0.10			
	Cadmium (Cd)-Total (mg/L)		<0.000017			
	Calcium (Ca)-Total (mg/L)		<0.10			
	Chromium (Cr)-Total (mg/L)		<0.0010			
	Cobalt (Co)-Total (mg/L)		<0.00030			
	Copper (Cu)-Total (mg/L)		<0.0010			
	Iron (Fe)-Total (mg/L)		<0.030			
	Lead (Pb)-Total (mg/L)		<0.00050			
	Lithium (Li)-Total (mg/L)		<0.0050			
	Magnesium (Mg)-Total (mg/L)		<0.10			
	Manganese (Mn)-Total (mg/L)		<0.00030			
	Mercury (Hg)-Total (mg/L)		<0.000020			
	Molybdenum (Mo)-Total (mg/L)		<0.0010			

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L687277-1	L687277-2	L687277-3	L687277-4	L687277-5
	Description					
	Sampled Date	12-SEP-08	12-SEP-08	12-SEP-08	12-SEP-08	12-SEP-08
	Sampled Time					
	Client ID	SP-NE1	SP-NE1	SP-SE2	SP-SE2	SP-SE3
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)	0.0013		0.0013		0.0014
	Potassium (K)-Total (mg/L)	<2.0		<2.0		<2.0
	Selenium (Se)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Silver (Ag)-Total (mg/L)	<0.000020		<0.000020		<0.000020
	Sodium (Na)-Total (mg/L)	<2.0		<2.0		<2.0
	Thallium (Tl)-Total (mg/L)	<0.00020		<0.00020		<0.00020
	Tin (Sn)-Total (mg/L)	<0.00050		<0.00050		<0.00050
	Titanium (Ti)-Total (mg/L)	0.020		0.016		0.020
	Uranium (U)-Total (mg/L)	0.00027		0.00028		0.00028
	Vanadium (V)-Total (mg/L)	<0.0010		<0.0010		<0.0010
	Zinc (Zn)-Total (mg/L)	<0.0050		<0.0050		<0.0050
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0515		0.0541		0.0589
	Antimony (Sb)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Arsenic (As)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Barium (Ba)-Dissolved (mg/L)	<0.020		<0.020		<0.020
	Beryllium (Be)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Boron (B)-Dissolved (mg/L)	<0.10		<0.10		<0.10
	Cadmium (Cd)-Dissolved (mg/L)	<0.000017		<0.000017		<0.000017
	Calcium (Ca)-Dissolved (mg/L)	2.95		3.00		3.00
	Chromium (Cr)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030		<0.00030		<0.00030
	Copper (Cu)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Iron (Fe)-Dissolved (mg/L)	0.047		0.045		0.050
	Lead (Pb)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.0050		<0.0050		<0.0050
	Magnesium (Mg)-Dissolved (mg/L)	0.91		0.90		0.88
	Manganese (Mn)-Dissolved (mg/L)	0.00111		0.00123		0.00135
	Mercury (Hg)-Dissolved (mg/L)	<0.000020		<0.000020		<0.000020
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Nickel (Ni)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Potassium (K)-Dissolved (mg/L)	<2.0		<2.0		<2.0
	Selenium (Se)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010
	Silver (Ag)-Dissolved (mg/L)	<0.000020		<0.000020		<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0		<2.0		<2.0
	Thallium (Tl)-Dissolved (mg/L)	<0.00020		<0.00020		<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050		<0.00050		<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010		<0.010		<0.010
	Uranium (U)-Dissolved (mg/L)	<0.00020		<0.00020		<0.00020
	Vanadium (V)-Dissolved (mg/L)	<0.0010		<0.0010		<0.0010

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L687277-6	L687277-7			
	Sample ID	L687277-6	L687277-7			
	Description					
	Sampled Date	12-SEP-08	25-AUG-08			
	Sampled Time					
	Client ID	SP-SE3	TRAVEL BLANK (DIKE CONST)			
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)		<0.0010			
	Potassium (K)-Total (mg/L)		<2.0			
	Selenium (Se)-Total (mg/L)		<0.0010			
	Silver (Ag)-Total (mg/L)		<0.000020			
	Sodium (Na)-Total (mg/L)		<2.0			
	Thallium (Tl)-Total (mg/L)		<0.00020			
	Tin (Sn)-Total (mg/L)		<0.00050			
	Titanium (Ti)-Total (mg/L)		<0.010			
	Uranium (U)-Total (mg/L)		<0.00020			
	Vanadium (V)-Total (mg/L)		<0.0010			
	Zinc (Zn)-Total (mg/L)		<0.0050			
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silver (Ag)-Dissolved (mg/L)					
	Sodium (Na)-Dissolved (mg/L)					
	Thallium (Tl)-Dissolved (mg/L)					
	Tin (Sn)-Dissolved (mg/L)					
	Titanium (Ti)-Dissolved (mg/L)					
	Uranium (U)-Dissolved (mg/L)					
	Vanadium (V)-Dissolved (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L687277-1	L687277-2	L687277-3	L687277-4	L687277-5
	Description					
	Sampled Date	12-SEP-08	12-SEP-08	12-SEP-08	12-SEP-08	12-SEP-08
	Sampled Time					
	Client ID	SP-NE1	SP-NE1	SP-SE2	SP-SE2	SP-SE3
Grouping	**Analyte**					
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)	<0.0050		<0.0050		<0.0050
Plant Pigments	Chlorophyll a (ug)		0.314		0.262	

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L687277-6	L687277-7			
	Description					
	Sampled Date	12-SEP-08	25-AUG-08			
	Sampled Time					
	Client ID	SP-SE3	TRAVEL BLANK (DIKE CONST)			
WATER						
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)					
Plant Pigments	Chlorophyll a (ug)	0.546				

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-SCR-VA	Water	Alkalinity by colour or titration	EPA 310.2 OR APHA 2320

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.
OR
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CHLOROA-VA	Water	Chlorophyll a by Fluorometer	APHA 10200 H. "Chlorophyll" and EPA 445

Chlorophyll and Pheopigments by Fluorometry analysis is carried out using procedures adapted from APHA Method 10200 H. "Chlorophyll" and USEPA Method 445. The sample is filtered using either a glass fiber filter or a 0.45 micron Membrane filter. The pigments are extracted from the filter with 90% aqueuos acetone. For chlorophyll a analysis the extract is read using a fluorometer. For pheopigments the extract is first acidified then read. This method is not subject to interferences from chlorophyll b.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-DIS-CCME-CVAFS-VA	Water	Diss. Mercury in Water by CVAFS (CCME)	EPA 3005A/245.7

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-CCME-CVAFS-VA	Water	Total Mercury in Water by CVAFS (CCME)	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-DIS-CCME-ICP-VA	Water	Diss. Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-CCME-MS-VA	Water	Diss. Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-TOT-CCME-ICP-VA	Water	Total Metals in Water by ICPOES (CCME)	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-CCME-MS-VA	Water	Total Metals in Water by ICPMS (CCME)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

NH3-SIE-VA	Water	Ammonia by SIE	APHA 4500-NH3 "Nitrogen (Ammonia)"

This analysis is carried out, on sulphuric acid preserved samples, using procedures adapted from APHA Method 4500-NH3 "Nitrogen (Ammonia)". Ammonia is determined using an ammonia selective electrode.

PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

PO4-DO-COL-VA	Water	Dissolved ortho Phosphate by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)

phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

PO4-T-COL-VA	Water	Total Phosphate P by Color	APHA 4500-P "Phosphorous"

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

SILICATE-COL-VA	Water	Silicate by Colourimetric analysis	APHA 4500-SIO2 D.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 D. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TKN-SIE-VA	Water	Total Kjeldahl Nitrogen by SIE	APHA 4500-Norg (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total kjeldahl nitrogen is determined by sample digestion at 367 celcius with analysis using an ammonia selective electrode.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

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GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
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CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

PAGE 1 OF 1

SEND REPORT TO:			
COMPANY:	Azimuth Consulting Group Inc.		
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CONTACT:	R. Baker, M. McConnell	TELEPHONE:	
PROJECT NAME/#:	DIKE CONSTRUCTION	SAMPLER:	[redacted], [redacted] DH, KM
ALSE QUOTE #:	ALSEQ-07-622	ALSE CONTACT:	Natasha Marcovic-Mirovic

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◉ Routine Turn Around
○ Rush (Surcharges May Apply) Specify Due Date: Time:

ANALYSIS REQUESTED:

SAMPLE IDENTIFICATION	DATE COLLECTED YY-MM-DD	Time	MATRIX	Conventionals **	TKN, Ammonia (pres. w/ H_2SO_4)	Total Metals (pres. w/ HNO_3)	Dissolved Metals (filtered & pres.)	TOC (pres. w/ HCl)	DOC (filtered & pres. w/ HCl)		Chlorophyll-a (pres. w/ $MgCO_3$)	NOTES (sample specific comments, due dates, etc.)
SP-NE1	08-09-12		water	x	x	x	x	x	x			6 containers
SP-NE1	08-09-12		filter								x	1 container (500ml filt.)
SP-SE2	08-09-12		water	x	x	x	x	x	x			6 containers
SP-SE2	08-09-12		filter								x	1 container (500ml filt.)
SP-SE3	08-09-12		water	x	x	x	x	x	x			6 containers
SP-SE3	08-09-12		filter								x	1 container (1L filt.)
Travel Blank (Dike Construction)	08-08-25		water	x	x	x		x				4 containers

FOR LAB USE ONLY

****Conventionals**: conductivity, hardness, pH, TSS, TDS, nutrients(nitrate, nitrite, total phosphate, orthophosphate, silicate), sulphate, chloride, alkalinity(bicarbonate, carbonate, hydroxide).

RELINQUISHED BY:				RECEIVED BY:			
NAME:	Maggie McConnell	DATE:	Sept.20 2008	NAME:		DATE:	HD 08/09/24
OF:	Azimuth Consulting Group Inc.	TIME:		OF:		TIME:	3:11
NAME:	Maggie McConnell (signature)	DATE:		NAME:		DATE:	
OF:		TIME:		OF:	ALS Environmental	TIME:	

Special Instructions / Comments (billing details, QC reporting, etc.):

FOR LAB USE ONLY Cooler Seal Intact? Yes___ No ✓ N/A___ Sample Temperature: 7 °C Frozen? Yes___ No ✓ Cooling Method? Icepacks ✓ Ice___ None___

APPENDIX D

DAILY SUMMARY OF TSS CONCENTRATIONS FOR ROUTINE MONITORING STATIONS – WESTERN CHANNEL DIKE

Appendix D

Western Channel Dike Construction Monitoring 2008

Daily Summary of TSS Concentrations for Routine Monitoring Stations.

		Routine Stations (50m from turb barriers)					
		WCS (impoundment)			WCT (Third Portage)		
Date of Analysis	Time of Analysis	24h Max	24h Ave	7-d Ave	24h Max	24h Ave	7-d Ave
23-Sep-08	20:00	4.3			0.5		
24-Sep-08	20:00	4.3	4.02 (n/a)	4.02 (n/a)	0.5		
25-Sep-08	20:00	5.0	4.3	4.16 (n/a)	0.4	0.4	0.46 (n/a)
26-Sep-08	19:00	16.3	9.8	5.94 (n/a)	NND	NND	NND
27-Sep-08	19:00	22.8	16.0	7.88 (n/a)	0.3	0.3	0.42 (n/a)
28-Sep-08	22:00	15.6	13.3	9.81 (n/a)	0.3	0.3	0.4 (n/a)
29-Sep-08	20:00	26.9	19.3	11.33 (n/a)	0.3	0.3	0.37 (n/a)
30-Sep-08	23:30	12.6	11.9	11.39 (n/a)	0.3	0.2	0.36 (n/a)
2-Oct-08	21:00	8.5	8.1	13.2	0.4	0.4	0.3
3-Oct-08	20:00	7.7	6.8	12.9	0.4	0.4	0.3
4-Oct-08	20:00	8.1	8.1	12.0	NND	NND	NND
5-Oct-08	21:00	7.4	7.4	10.6	NND	NND	NND
6-Oct-08	21:00	11.9	11.9	9.1	NND	NND	NND
7-Oct-08	20:00	10.2	10.2	8.3	0.3	0.3	0.3
8-Oct-08	20:00	11.0	11.0	8.7	0.3	0.2	0.3
9-Oct-08	18:00	10.4	10.4	9.2	0.3	0.3	0.3
10-Oct-08	21:00	11.2	11.2	10.2	0.3	0.3	0.3
11-Oct-08	20:00	8.9	8.9	10.1	0.3	0.3	0.3
12-Oct-08	21:00	7.6	7.6	9.9	0.3	0.3	0.3
13-Oct-08	18:00	7.1	7.1	9.6	NND	NND	NND
14-Oct-08	20:00	5.8	5.8	8.7	NND	NND	NND
15-Oct-08	20:00	6.0	6.0	8.4	NND	NND	NND

Notes:

1. TSS estimates (mg/L) were calculated from turbidity measurements using TSS-turbidity regression equations (see **Section 2.2.2** for details).
2. If a cell has "n/a" after the number, this means that sampling has not yet covered a period long enough to cover (24h or 7-d), but the average up to that date and time is still calculated.
3. Red (or dark shade if b/w) cells are exceedances of relevant TSS thresholds for a particular station at a particular time; yellow (or light shade if b/w) cells highlight values approaching TSS triggers.
4. TSS Thresholds are as follows: (a) 24-h threshold = 50 mg/L at all stations (b) 7-d threshold = 15 mg/L at all stations; thresholds for high value habitat did not apply (see text).
5. NND = no new data

March 18, 2009

FINAL REPORT ON

CONTROL OF SUSPENDED SOLIDS AT SECOND AND THIRD PORTAGE LAKES - CONSTRUCTION OF EAST, SOUTH CAMP AND BAY-GOOSE DIKES - MEADOWBANK GOLD PROJECT, NUNAVUT

Submitted to:
Agnico-Eagle Mines Limited
Meadowbank Division
Suite 375, Two Bentall Centre
Box 209 – 555 Burrard Street
Vancouver, BC
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REPORT

Project Number: 08-1428-0028/6000
Doc. No.: 806 Ver. 0

Distribution:

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3 Copies - Meadowbank Dike Review Board
2 Copies - Golder Associates Ltd.

Golder Associates

Executive Summary

AEM commissioned Golder Associates Ltd (Golder) to conduct a TSS (Total Suspended Solids) management study for the construction activities that are scheduled for 2009 and 2010 in the Bay-Goose Dike area. Turbidity within Third and Second Portage Lakes during the Bay Goose Dike construction was raised as an issue of concern. Turbidity is typically used as a surrogate to TSS level in water. The objective of this TSS management study was to identify and describe the measures that can be implemented to control the amount of suspended solids released to the aquatic environment from the construction area.

The available turbidity measurements from Second Portage Lake during East Dike construction in 2008 were analyzed to evaluate the main sediment entrainment and transport processes and issues associated with use of the turbidity barriers during dike construction. This analysis provided a basis for identifying methods for controlling turbidity levels to meet regulatory requirements for construction of the dikes in Third Portage Lake.

Lakebed sediments at both Second and Third Portage Lake are the most likely source of suspended solids in water due to their relatively large fraction of fine particles. The construction activity with the greatest potential for entraining solids in water is most likely rockfill placement and excavation during dike construction. Among all of the construction activities, rockfill placement involves the largest amount of materials added into the lake and likely causes solid entrainment in the water from the contact between the falling materials and the lakebed. The amount of solids entrained into the water would depend on the thickness of the layer of fine lakebed sediments impacted by the falling rockfill. The thicker the layer, the more solids are expected to be entrained to the water.

For construction of the East Dike, a free space was provided underneath the turbidity barriers to allow water flow between the construction area and remainder of the lake. The barriers were made of vinyl, which is an impervious material. Eliminating this free space, or extending the barriers from the lake surface to the bottom across the entire alignments, could potentially cause failure of the barriers (*i.e.,* submergence or ripping).

Turbidity barriers are proposed for controlling turbidity levels to meet regulatory requirements during construction of South Camp and Bay-Goose Dikes in Third Portage Lake. The barriers would be extended to the bottom of the lake for most of their deployment. Openings need to be present at selected locations along the barriers to allow: (1) exchange of water between the enclosed areas and the lake; and (2) maximization of solid settling opportunity before the sediment laden water leaves the enclosed areas.

A field survey for characterizing the fine lakebed sediments at Third Portage Lake is recommended for supporting the final determination of the location of the turbidity barriers at the Bay-Goose Dike construction area. The survey should include quantification of fine sediments within the dike footprint where sediment pockets would be expected. Samples should be taken at these locations and analyzed to determine grain size distribution, organic content and specific gravity.

Table of Contents

1.0 INTRODUCTION 1

2.0 PHYSICAL SETTING AND BASELINE CONDITIONS 4

2.1 General 4

2.2 Wind and Rainfall 4

2.3 Hydrology 7

2.4 Lakebed Sediments 9

3.0 ASSESSMENT OF TURBIDITY AT SECOND PORTAGE LAKE 12

3.1 Turbidity Barrier and Monitoring 12

3.2 Construction Activities and Their Linkage to Entraining Sediments 15

3.3 Observed Turbidity Levels 16

3.4 Conclusions 17

4.0 BAY-GOOSE DIKE CONSTRUCTION AREA 19

4.1 Turbidity Barriers for Bay-Goose Dike Construction 19

4.1.1 Deployment Methods 19

4.1.2 Operational and Design Considerations 19

4.1.3 Options for Deployment of Additional Barriers 20

4.1.4 Required Inventory of Turbidity Barriers 20

4.2 South Camp Dike 21

4.3 Proposed Field Survey 24

5.0 CLOSURE 26

REFERENCES 27

TABLES

Table 1: Observed Hourly Average and Maximum Wind Speeds (1963 to 2008) 5

Table 2: Frequency Analysis of Hourly Wind Speeds 6

Table 3: Hydrometric Characteristics at Second and Third Portage Lakes 7

Table 4: Turbidity Measurement Stations in Second Portage Lake 13

Table 5: Construction Activities at East Dike 15

Table 6: Average Turbidity Levels Recorded on July 31, 2008 to September 30, 2008 16

Table 7: Estimates of Required Turbidity Barrier Segments 21

FIGURES

Figure 1: Meadowbank Gold Project Mine Site Location 2
Figure 2: Location of Dikes in Second and Third Portage Lakes 3
Figure 3: Averaged Daily Wind Speed from July 31, 2008 to September 30, 2008 4
Figure 4: Averaged Daily Wind Direction from July 31, 2008 to September 30, 2008 5
Figure 5: Observed Daily Rainfall from July 31, 2008 to September 30, 2008 6
Figure 6: Bathymetry of Second and Third Portage Lakes 8
Figure 7: Settling Velocities of Sand Size to Fine Grained Particles 9
Figure 8: Granulometry of Lakebed Till and Sediment 10
Figure 9: Fine Sediment Pockets Identified at Second and Third Portage Lakes 11
Figure 10: Turbidity Barriers at Second Portage Lake (July 24, 2008) 12
Figure 11: Location of 2008 Turbidity Barriers and Measurement Stations 14
Figure 12: Observed Variation of Average Turbidity (July 31 to September 30) with Depth 17
Figure 13: Proposed Turbidity Barrier Location for Bay-Goose Dike – North Section 22
Figure 14: Proposed Turbidity Barrier Location for Bay-Goose Dike – South Section 23
Figure 15: Proposed Sediment Survey Locations 25

APPENDICES

APPENDIX I
Turbidity Measurements at Second Portage Lake (July 31, 2008 to September 30, 2008)

APPENDIX II
Turbidity Observations Over Time (July 31, 2008 to September 30, 2008)

APPENDIX III
Turbidity Observations Over Depth

1.0 INTRODUCTION

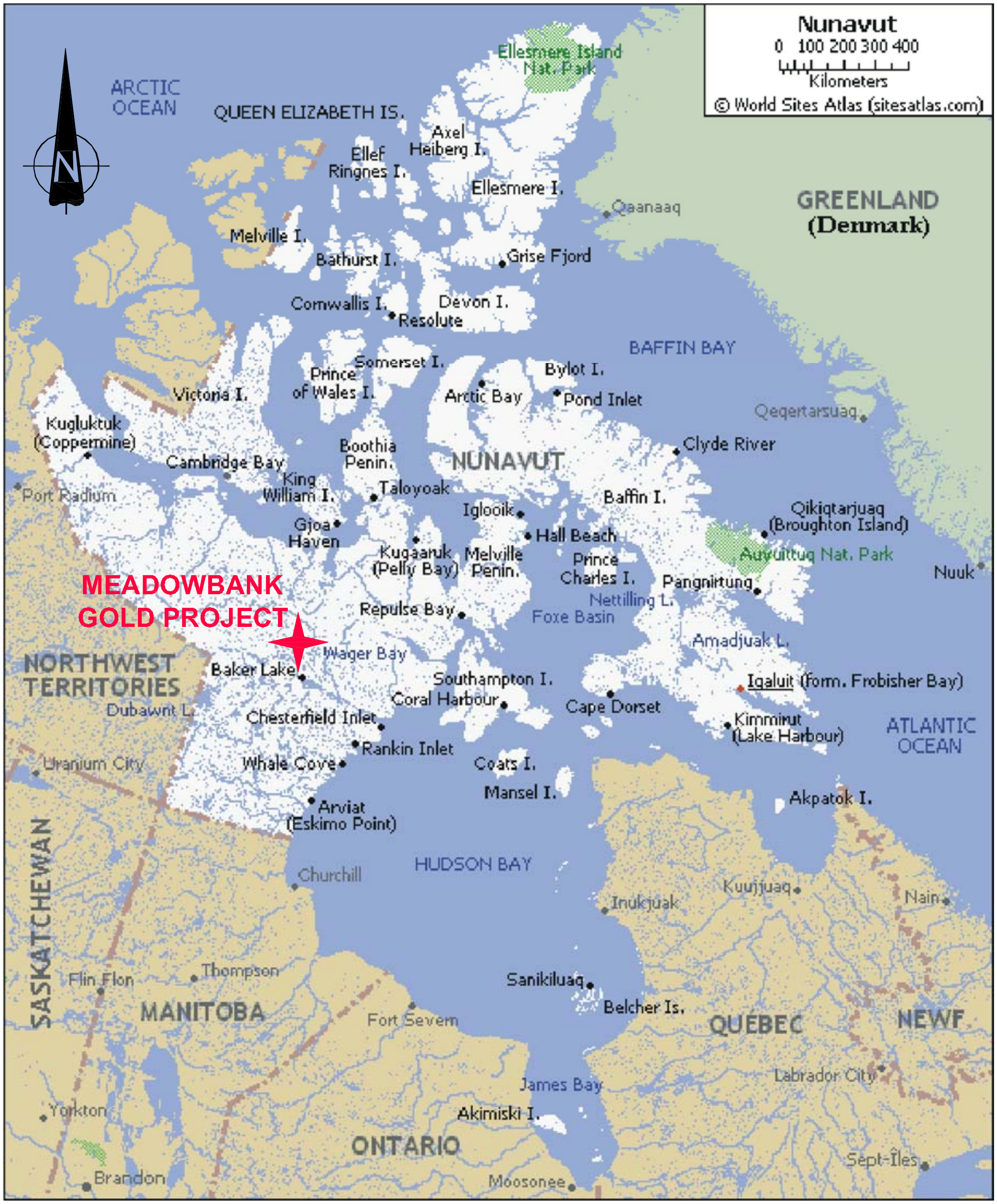
In 2008, Agnico-Eagle Mine Limited (AEM) initiated the construction phase of its Meadowbank Gold Mine project, which is located 70 km north of Baker Lake, in Nunavut (see Figure 1). The Portage and Goose open pits of this mining development are located in areas within Second and Third Portage Lakes. The construction phase includes building the East, Bay-Goose and South Camp Dikes to isolate the areas of these waterbodies for mining activities (see Figure 2).

AEM commissioned Golder Associates Ltd (Golder) to develop a TSS management plan for the construction activities that are scheduled for 2009 and 2010 in the Bay-Goose Dike area. The objective of this plan is to describe measures that could be implemented to control the amount of suspended solids released to the aquatic environment from the construction area.

The construction of the East Dike was initiated in the summer of 2008. A summary of this process was presented on September 18, 2008 in a meeting with the Meadowbank Dike Review Board. During that meeting, the control of turbidity within Third and Second Portage Lakes during the Bay Goose Dike construction was raised as an issue of concern. Turbidity is typically employed as a surrogate to total suspended solid (TSS) levels in water.

Turbidity measurements collected (by others) during the 2008 East Dike construction were analyzed to evaluate the main sediment entrainment and transport processes and issues associated with use of the turbidity barriers in Second Portage Lake. This analysis provided a basis for identifying a method for the deployment of turbidity barriers for controlling turbidity levels and meeting regulatory requirements for construction of the dikes in Third Portage Lake.

This report also presents recommendations for a field survey to determine the final location of the turbidity barriers for the Bay-Goose Dike construction.



PROJECT

AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

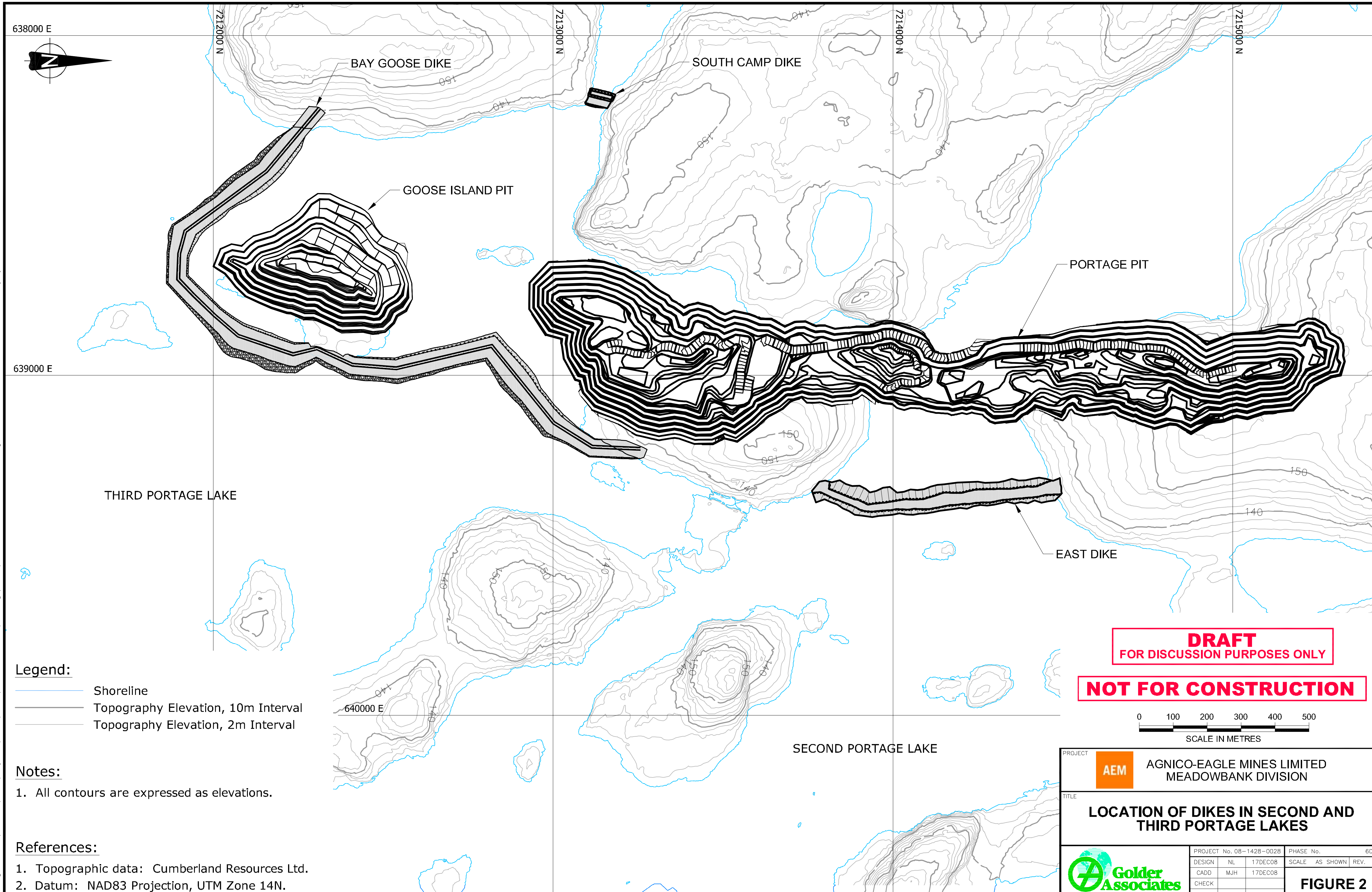
TITLE

MEADOWBANK GOLD PROJECT
MINE SITE LOCATION

Golder Associates

PROJECT No. 08-1428-0028			FILE No. 0814280028-6000-01_A	
DESIGN	NL	17DEC08	SCALE AS SHOWN	REV. –
CADD	MJH	17DEC08	FIGURE 1	
CHECK				
REVIEW				

REVISION DATE: 08/12/17 05:04PM By: MHintoy CADD FILE: N:\Bur-Graphics\Projects\2008\1428\08-1428-0028\Drafting\6000\0814280028-6000-01_A.dwg



Legend:

- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval

Notes:

1. All contours are expressed as elevations.

References:

1. Topographic data: Cumberland Resources Ltd.
2. Datum: NAD83 Projection, UTM Zone 14N.

PROJECT
AEM
AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE
LOCATION OF DIKES IN SECOND AND THIRD PORTAGE LAKES

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 08-1428-0028			PHASE No. 6000
DESIGN	NL	17DEC08	SCALE AS SHOWN REV. –
CADD	MJH	17DEC08	
CHECK			**FIGURE 2**
REVIEW			

2.0 PHYSICAL SETTING AND BASELINE CONDITIONS

2.1 General

The following sections describe the pertinent climatic, hydrologic and lakebed sediment characteristics that affect entrainment and transport of solids in Second and Third Portage Lakes.

The composition of the lakebed sediments determines the characteristics of the solids that may be entrained into water column during dike construction. Once entrained into the water column, the transport of the solids is affected by the ambient lake currents and the local currents caused by displacement of water by the dike materials. The ambient lake currents are affected by wind, the watershed inflows to the lake, the lake outflows, and the lake bathymetry.

2.2 Wind and Rainfall

Wind induces currents in a waterbody as a result of shear stress at the water surface and is a relevant climatic variable in assessing suspended sediment transport within lakes. Hourly observations of wind speed and direction at the Environment Canada Baker Lake station (EC 2008) from 1963 to 2008 were obtained and processed. It was estimated that wind characteristics at Baker Lake are similar to those at Meadowbank, based on a comparison of the available wind data from 1997 to 2004 at these two locations (AMEC 2005).

Averaged daily wind speeds and directions during construction of East Dike from July 31, 2008 to September 30, 2008 are provided in Figure 3 and 4, respectively. Observed daily wind speeds ranged between 7 and 29 km/h. Winds were observed to occur primarily from the west, northwest and southwest, with episodes of south, southeast and east winds.

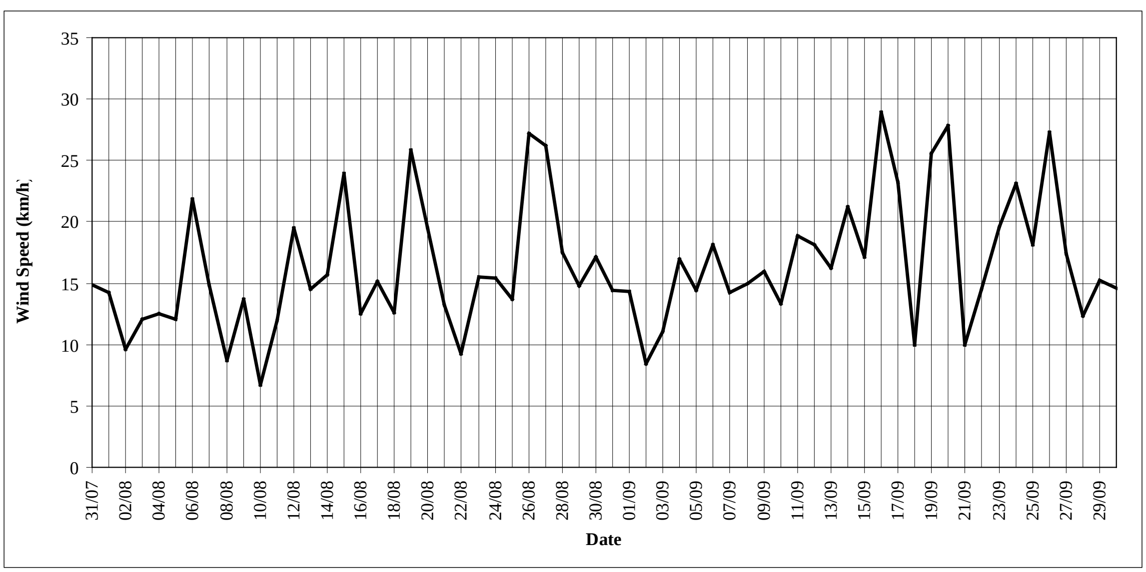


Figure 3: Averaged Daily Wind Speed from July 31, 2008 to September 30, 2008

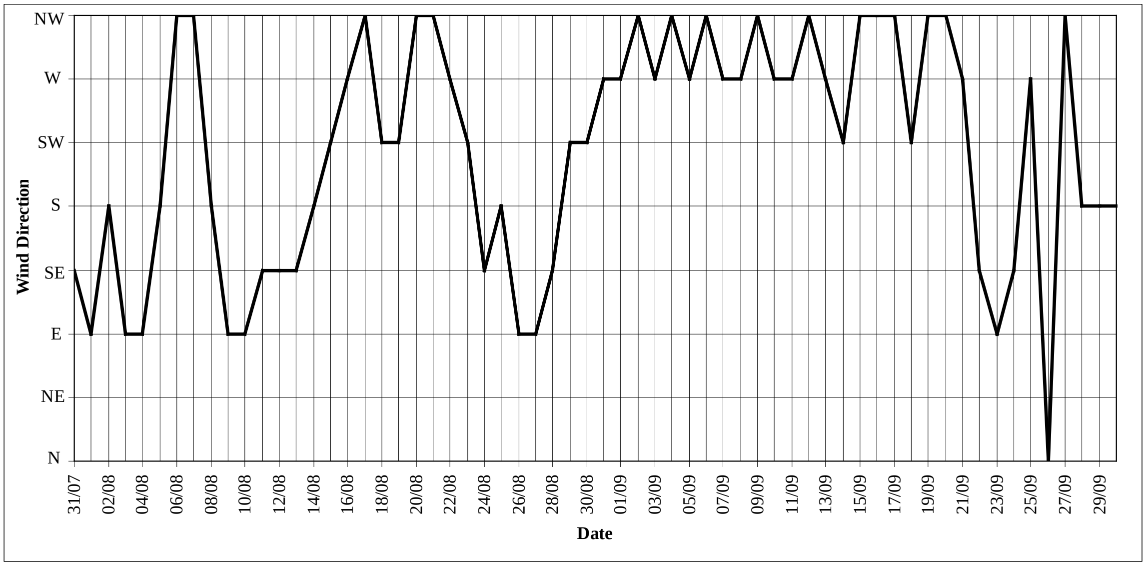


Figure 4: Averaged Daily Wind Direction from July 31, 2008 to September 30, 2008

Winds from the north and northwest occurred 50% of the time between 1963 and 2008, and the average wind speeds were the highest in these two directions (see Table 1). Maximum observed hourly wind speeds were also high from the north and northwest direction (*i.e.,* 85 and 91 km/h), although the highest observed hourly wind speed was from the west at 121 km/h.

A frequency analysis was also undertaken using the available Baker Lake wind record (1963 to 2008) to determine wind speeds in the major directions as a function of typical return period. The results are provided in Table 2.

Table 1: Observed Hourly Average and Maximum Wind Speeds (1963 to 2008)

Direction	Observed Hourly Wind Speed	
	Average (km/h)	Maximum (km/h)
N	23	85
NE	17	59
E	18	69
SE	17	70
S	15	65
SW	14	66
W	18	121
NW	23	91

Table 2: Frequency Analysis of Hourly Wind Speeds

Return Period (years)	N	NE	E	SE	S	SW	W	NW
2 [1]	61	44	52	51	40	38	47	61
5	68	50	58	58	47	45	58	70
10	72	54	62	62	51	50	67	76
25	76	57	66	67	57	56	81	85
50	79	59	69	70	60	60	93	91
100	82	61	71	72	64	65	108	98
200	84	63	73	74	68	70	125	105
500	88	65	76	77	73	76	151	115
1,000	90	66	78	79	77	81	176	123

1. The 2-year return period is approximately equivalent to the average of annual extreme wind.

Watershed runoff and subsequent inflows to the lake affect lake currents. Rainfall amounts and intensities during the open-water season affect the watershed runoff rates. Figure 5 illustrates daily rainfall observations from July 31, 2008 to September 30, 2008 at Baker Lake (EC 2008). Rainfall was relatively sparse, with approximately three events over more than one day that generated rainfall amounts greater than 10 mm (*i.e.,* from August 12 to 14, August 24 to 30 and September 23 to 25).

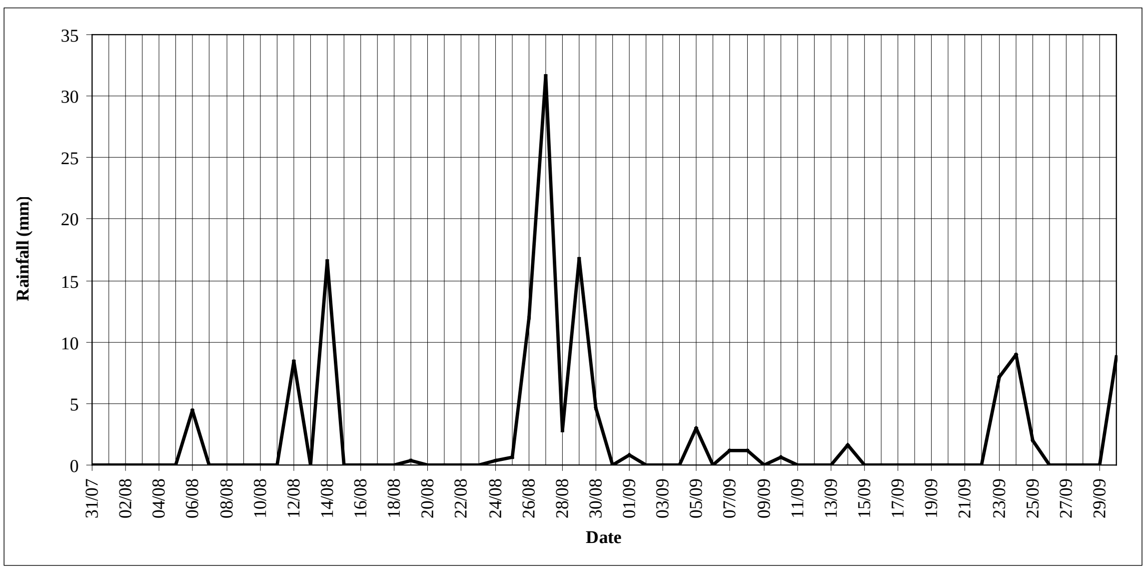


Figure 5: Observed Daily Rainfall from July 31, 2008 to September 30, 2008

2.3 Hydrology

The hydrologic characteristics of Second and Third Portage Lakes are presented in Table 3 and were derived from:

- An assessment of the watershed areas and annual lake runoff in the hydrologic baseline study for the Project (AMEC 2005); and
- A bathymetric survey of these lakes (Golder 2006; with updates completed in 2008).

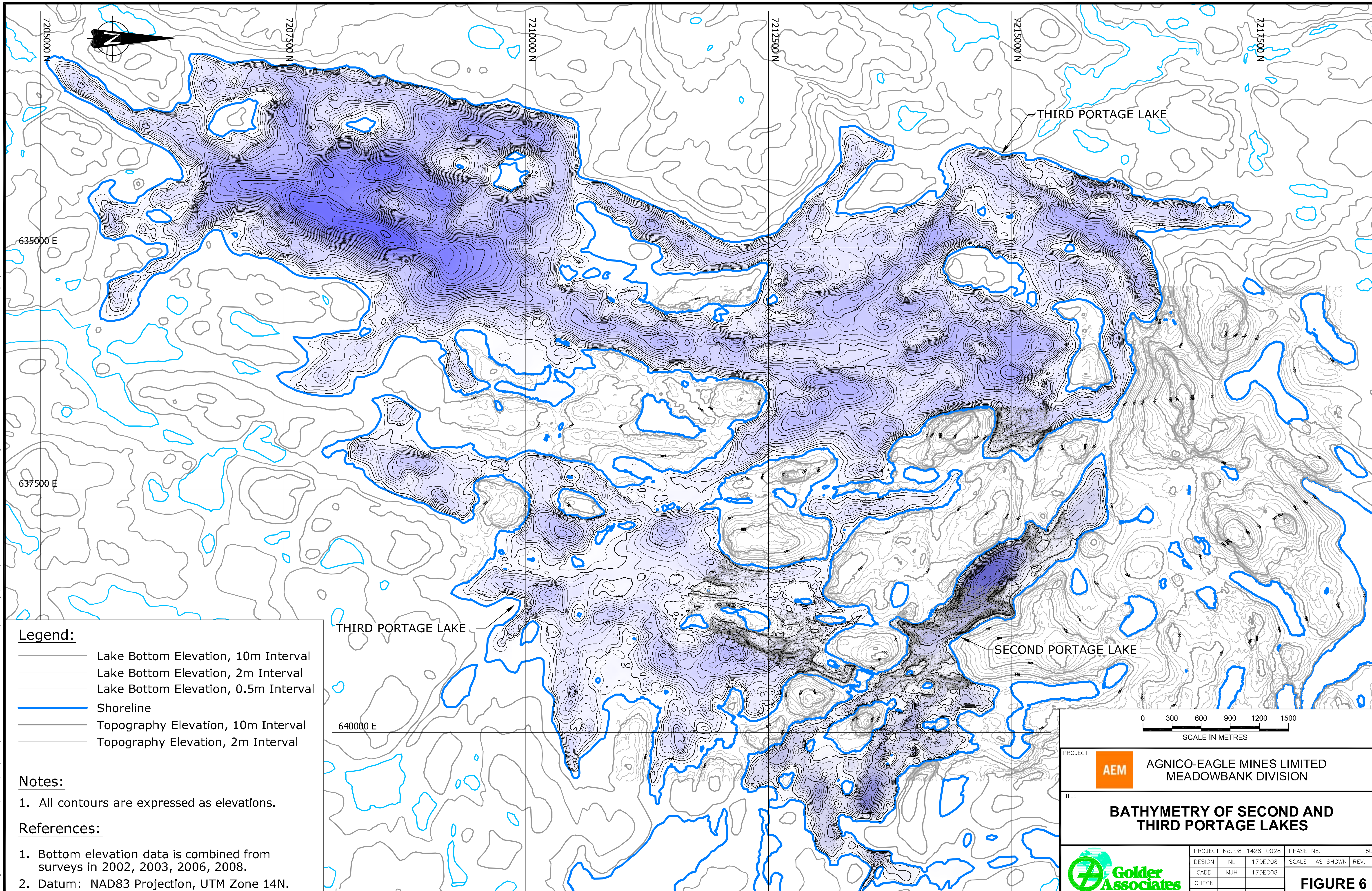
The watershed runoff typically occurs during the open-water season from June to September, and is negligible during the ice-cover season. The total watershed area of Second Portage includes Third Portage Lake to the northwest Turn, Vault, Wally and Drill Lakes to the north; the sub-watershed area to Second Portage Lake is 9.8 km^2 (AMEC 2005). The watershed runoff provides a source of water inflows to the lakes.

Table 3: Hydrometric Characteristics at Second and Third Portage Lakes

Lake	Area (km^2)		Average Lake	Volume ($10^6 m^3$)		Lake Retention
	Watershed [1]	Lake [2]	Depth (m) [3]	Lake [2]	Annual Watershed Runoff Inflow [1]	Time (years) [4]
Second Portage	210.5	3.9	7.7	29.7	28.6	1.0
Third Portage	88.9	33.1	13.5	446.2	10.0	44.8

1. The values were obtained from AMEC (2005).
2. The values were obtained from Golder (2006).
3. Average lake depths were obtained by dividing the lake volume by its area.
4. Lake retention times were estimated by dividing the lake volume by its annual watershed runoff inflow.

The 2006 bathymetric survey data (Golder 2006) were supplemented by an additional survey of the bathymetry at the proposed location of Bay-Goose Dike completed during the 2008 open water season. The results of the bathymetric surveys for Second and Third Portage Lakes are illustrated in Figure 6. For the design of the dikes, it was considered that the average water elevation at Second and Third Portage Lake are 133.1 and 134.1 masl, respectively (Golder 2008a).



Legend:

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval

Notes:

1. All contours are expressed as elevations.

References:

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

PROJECT

AEM

AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE

BATHYMETRY OF SECOND AND THIRD PORTAGE LAKES

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 08-1428-0028			PHASE No.	6000
DESIGN	NL	17DEC08	SCALE AS SHOWN	REV. –
CADD	MJH	17DEC08		
CHECK			**FIGURE 6**	
REVIEW				

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2.4 Lakebed Sediments

Lakebed surficial material is a potential source of solids to be entrained to the water column during dike construction. The subsequent deposition of the entrained or suspended solids through settling is affected by the direction and velocity of lake currents and settling characteristics (*i.e.,* velocities) of the solid particles. Based on Stoke's law (Shen and Julien 1993) for solid settling velocity, fine particles are more likely to remain in the water column once suspended, because small particles have low settling velocities. Furthermore, solids with a low specific gravity have comparatively lower settling velocities (see figure 7).

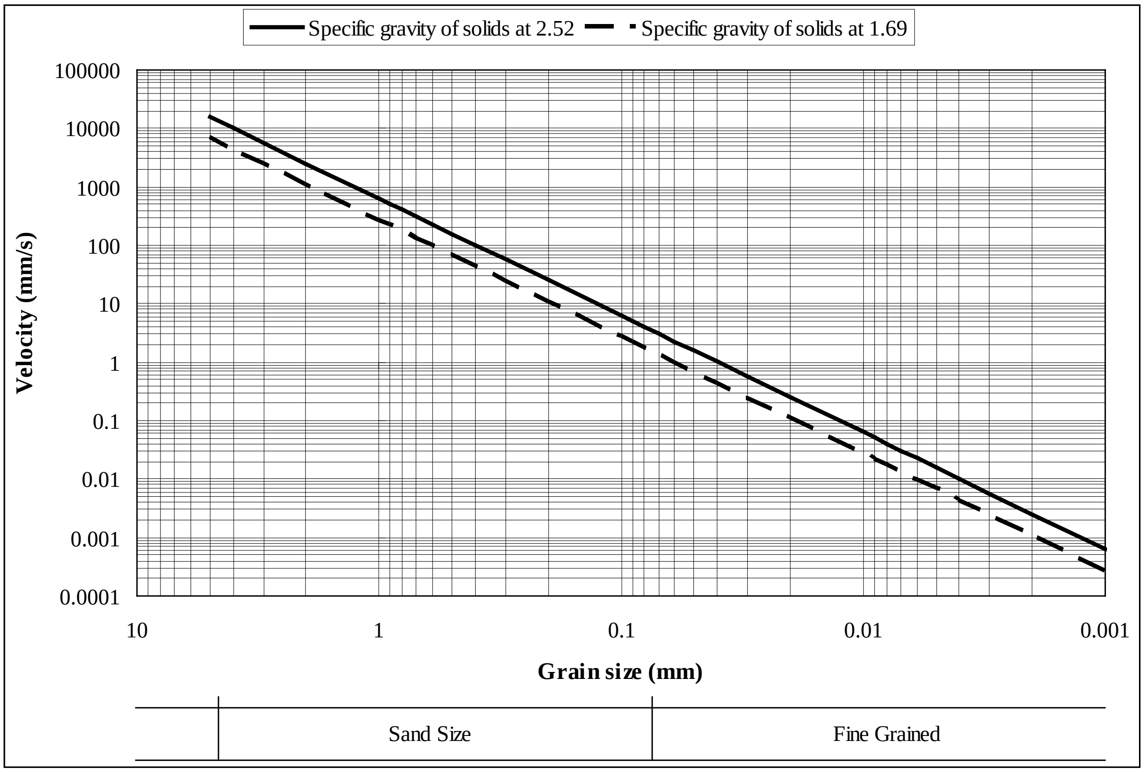


Figure 7: Settling Velocities of Sand Size to Fine Grained Particles

The characterization of borehole data at Second and Third Portage Lakes (Golder 2002a and b, 2003 and 2008b) indicates that the lakebed is typically composed of a till material overlying bedrock. An example of the grain size distribution for till and other construction materials used for the East Dike is provided in Figure 8 (Golder 2008a). It shows that between 20 and 35% of the till consists of fine grained particles.

As identified at some of the borehole locations, the lakebed may be composed of appreciably thick layer of fine sediments. The thicknesses observed from the borehole data and from tests with a penetrometer (*i.e.,* Seabed Terminal Impact Newton Gradiometer) ranged between 0.2 and 2.7 m (Golder 2007). The granulometry for a composite sediment sample is provided in Figure 8 (Golder 2008a). It indicates that the fine sediment material is composed of 15% sand size and 85% fine grained particles. Specific gravity of the sediments ranges from 1.69 when organic material is present, to 2.52 when there is no organic content (Golder 2008a).

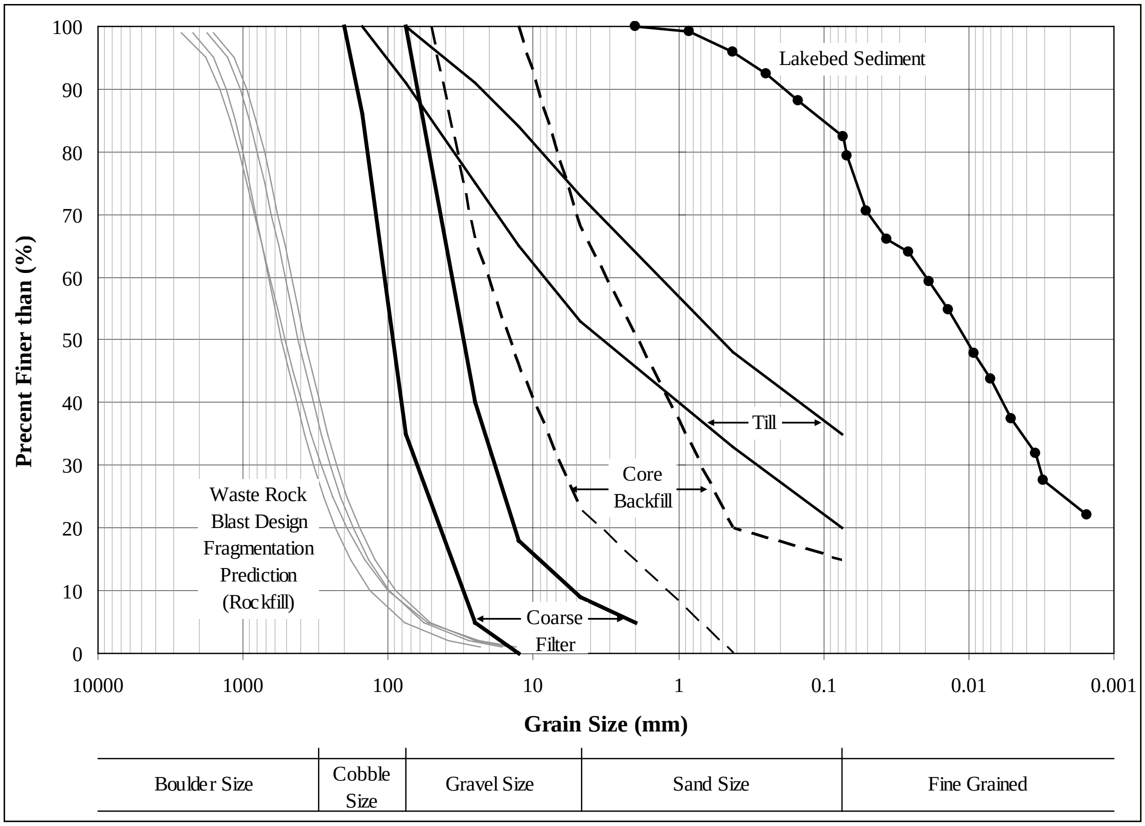
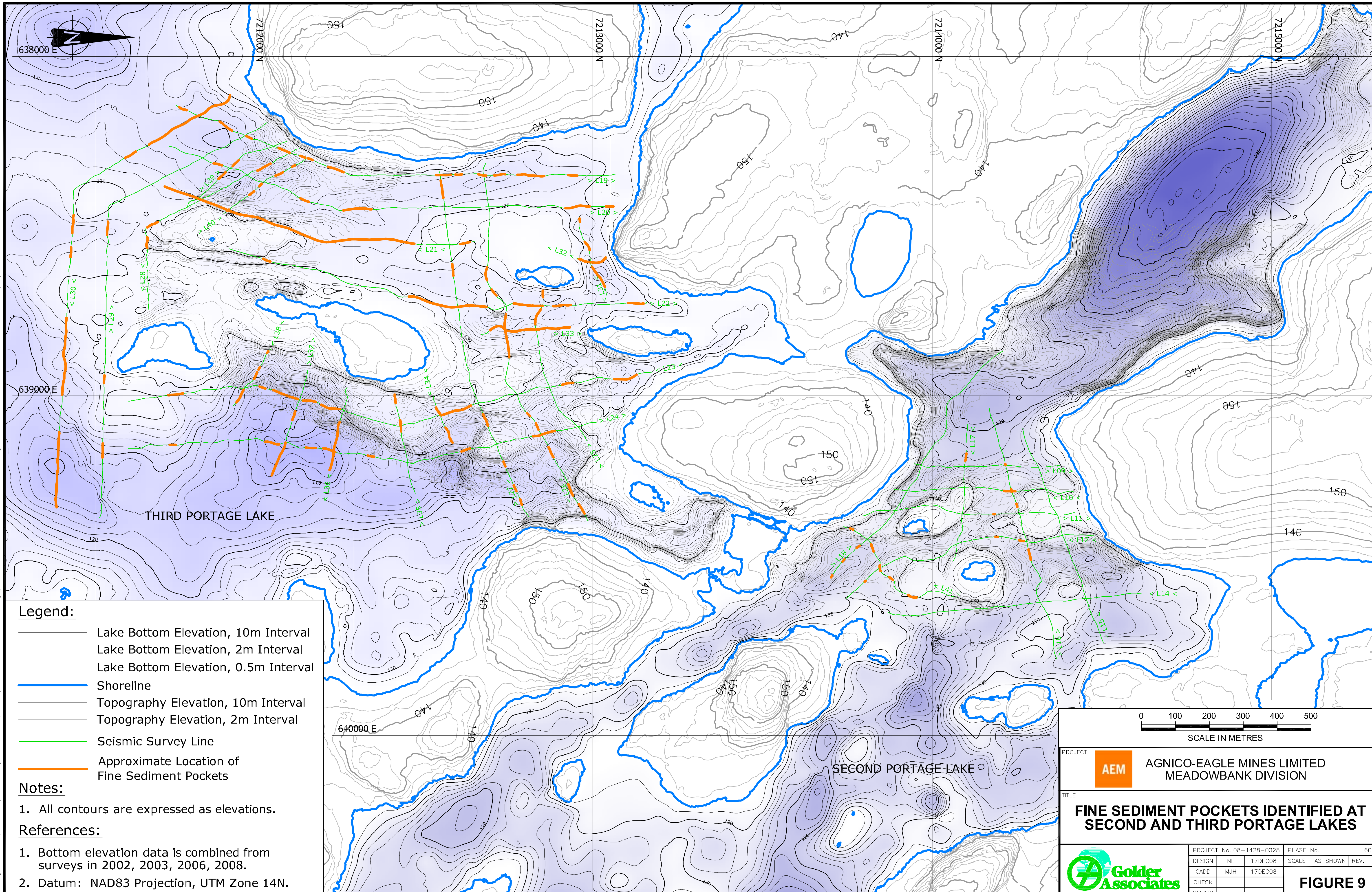


Figure 8: Granulometry of Lakebed Till and Sediment

Based on a mapping of the lakebed substrate from the fish habitat baseline study conducted at Second and Third Portage Lakes (Cumberland 2005), fine sediment accumulations tend to be located in regions of moderate to high depths within these waterbodies (*i.e.,* below 4 to 5 m water depth). Seismic profiles of the lakebed stratigraphy obtained September 12, 2006 to September 27, 2006 (Golder 2007) inferred the presence of fine sediment pockets that were appreciably thick. Figure 9 shows the locations of these inferred fine sediment pockets.



Legend:

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval
- Seismic Survey Line
- Approximate Location of Fine Sediment Pockets

Notes:

1. All contours are expressed as elevations.

References:

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

PROJECT

AEM

AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE

FINE SEDIMENT POCKETS IDENTIFIED AT SECOND AND THIRD PORTAGE LAKES

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 08-1428-0028			PHASE No.	6000
DESIGN	NL	17DEC08	SCALE AS SHOWN	REV. –
CADD	MJH	17DEC08		
CHECK				
REVIEW				

FIGURE 9

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3.0 ASSESSMENT OF TURBIDITY AT SECOND PORTAGE LAKE

3.1 Turbidity Barrier and Monitoring

Two rows of turbidity barriers were installed at Second Portage Lake in 2008 to control suspended solids within the construction area of East Dike (see Figure 10). The dike was built between the barriers, which were placed at a minimum of 50 m from the expected location of the dike's toe. The depth of the barriers generally extended to 1 m above the lake bed except where the water depth was less than 2 m (Golder 2008a). A Type 2 DOT barrier consisting of a polyester scrim coated with vinyl (Layfield 2008) was employed.

Figure 10: Turbidity Barriers at Second Portage Lake (July 24, 2008)

Observations of turbidity can be used as a surrogate for total suspended solid concentrations. Turbidity measurements were collected as part of the water quality monitoring and management plan for the construction of the East Dike (AEM 2008). The measurements were taken from July 31, 2008 to September 30, 2008 at 13 locations in Second Portage Lake (Gary Mann, Azimuth, pers. comm. on Oct. 7, 2008) as follows:

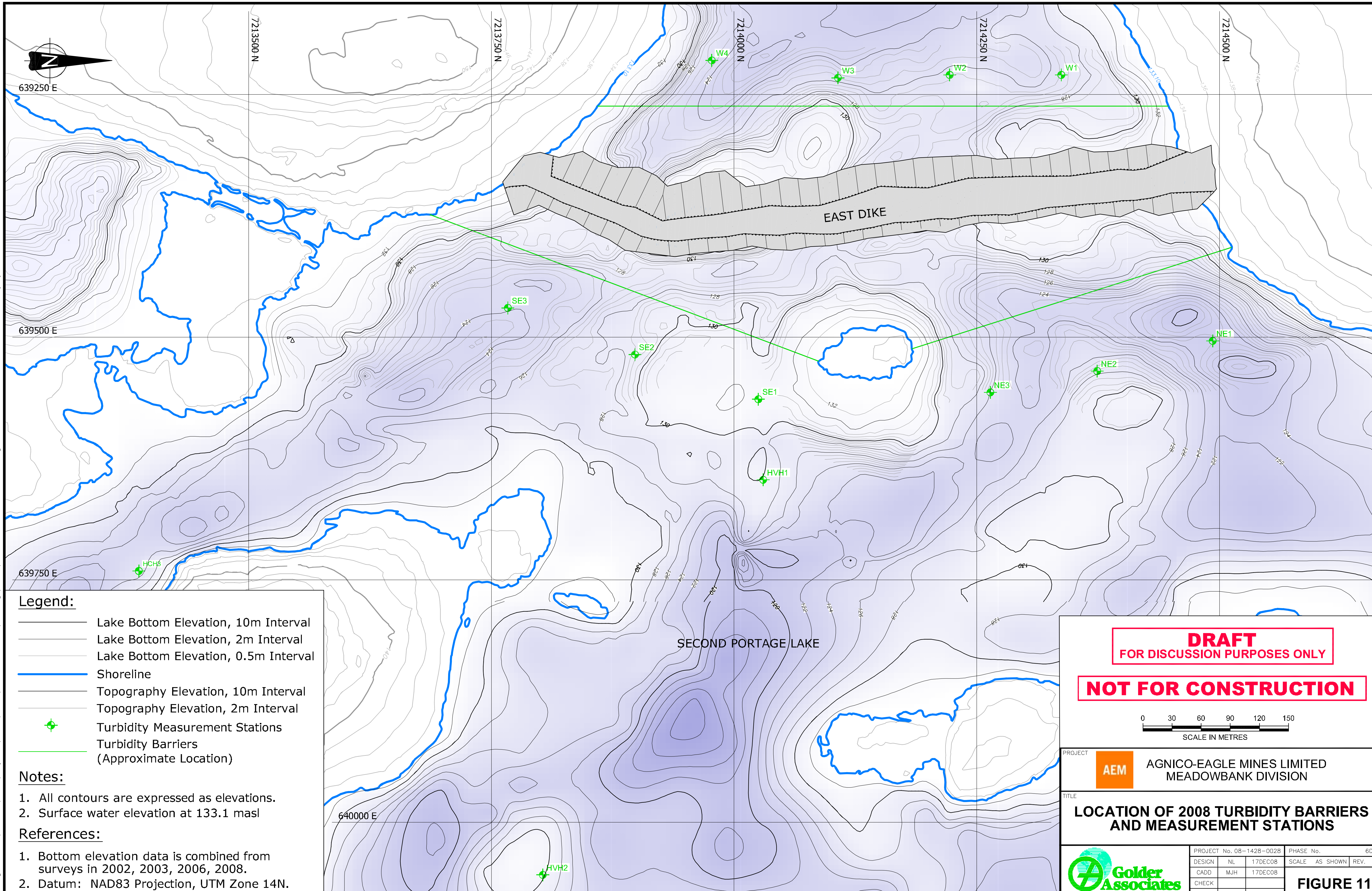
- Four stations (W1, W2, W3 and W4) were located west of the turbidity barrier on the west side of the dike;
- Six stations (NE1, NE2, NE3, SE1, SE2 and SE3) were located east of the turbidity barrier on the east side of the dike; and
- Three stations (HVH1, HVH2 and HVH3) were located at the estimated "High Value Habitat" areas for fish (Cumberland 2005) to the east of the dike.

Table 4 and Figure 11 summarize the station details. The measurements of turbidity at these stations were compiled and are presented in Appendix I. Turbidity measurements were taken at the water surface and at the depth where the maximum value was observed. Measurements at depth intervals were recorded to establish turbidity profiles. Measurements were taken at least once a day, except for those days listed in Table 4.

Table 4: Turbidity Measurement Stations in Second Portage Lake

Station	Easting	Northing	Lake Bottom Elevation (masl)	Water Depth (m) [1]	Days of No Measurement [2]
W1	639230	7214337	127	6.1	August 15, 26 and 27; and September 11, 15, 16, 20, 22, 24 and 26
W2	639230	7214222	127	6.1	
W3	639233	7214107	126	7.1	
W4	639215	7213977	125	8.1	
NE1	639504	7214493	122	11.1	July 31; August 26 and 27; and September 11, 20, 22, 24 and 26 to 29
NE2	639535	7214374	128	5.1	July 31; August 26, 27 and 28; and September 11, 20, 22, 24 and 26 to 29
NE3	639557	7214264	126	7.1	
SE1	639564	7214025	130	3.1	July 31; August 26; and September 11, 22, 24 and 26 to 29
SE2	639518	7213898	129	4.1	
SE3	639470	7213767	125	8.1	
HVH1	639647	7214030	130	3.1	August 26 and 28; and September 11, 20, 22, 24 and 26 to 29
HVH2	640054	7213803	130	3.1	July 31; August 26, 27 and 28; and September 11, 20, 22, 24 and 26 to 28
HVH3	639741	7213387	126	7.1	July 31; August 26; and September 11, 22, 24 and 26 to 28

1. Water depth was calculated based on a surface water elevation of 133.1 masl.
2. The period of record extends from July 31, 2008 to September 30, 2008.



Legend:

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval
- Turbidity Measurement Stations
- Turbidity Barriers (Approximate Location)

Notes:

1. All contours are expressed as elevations.
2. Surface water elevation at 133.1 masl

References:

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

DRAFT
FOR DISCUSSION PURPOSES ONLY

NOT FOR CONSTRUCTION

PROJECT
AEM
AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE
LOCATION OF 2008 TURBIDITY BARRIERS AND MEASUREMENT STATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 08-1428-0028			PHASE No. 6000
DESIGN	NL	17DEC08	SCALE AS SHOWN REV. –
CADD	MJH	17DEC08	
CHECK			**FIGURE 11**
REVIEW			

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3.2 Construction Activities and Their Linkage to Entraining Sediments

The construction activities conducted at the East Dike from July 31, 2008 to September 30, 2008 are described in Table 5. The following processes associated with the construction activities are believed to have contributed to solid entrainment and suspension in the water column:

- Rock Fall: The finer fraction of rockfill was entrained into the water column when rock was pushed into the lake due to the shear generated between the falling rock and water;
- Rock Contact with Lakebed Sediments: The finer fraction of the lakebed material was entrained into the water column due to the impact force by the falling rock onto the lakebed sediments;
- Removed Volume: Material excavation in the center of the dike created a void that was filled with water from the lake. This filling induced currents through the rockfill, which may have caused solid re-suspension from the lakebed and/or rockfill, or may have affected solid settling in areas near the dike; and
- Added Volume: Rockfill placement caused water movement away from the construction area, and core backfill placement caused water movement through the rockfill toward the lake areas adjacent to the dike This placement induced currents through the rockfill and away from the dike, which may have caused solid re-suspension from the lakebed and/or rockfill, or may have affected solid settling in areas near the dike.

Table 5: Construction Activities at East Dike

Activity	Period of Activity	Description	Volume of Material Added or Removed (m^3)
Rockfill Placement	July 30 to August 17 (19 days)	Dumping of rockfill at the advancing end of the active rockfill embankment, then pushing the rockfill over the edge into the water.	140,000 (added)
Excavation of Rockfill	August 6 to 20 (15 days)	Excavation of the rockfill at the proposed location of the dike core.	37,330 (removed)
Placement of Coarse Filter	August 15 to 25 (11 days)	Placement of a coarse granular material on the downstream face of the excavation.	3,200 (added)
Placement of Core Backfill	August 17 to 30 (14 days)	Placement of granular materials to fill in the excavated area of the rockfill.	20,000 (added)
Dynamic Compaction of Core Backfill	August 28 to September 7 (11 days)	Densification of the dike core by compaction and filling with granular materials.	20,000 (added)
Placement of Cutoff Wall	September 7 to 22 (16 days)	Excavation of a trench in the dike core, then filling of the trench with till material mixed with bentonite.	5,220 (removed) and 5,375 (added)

3.3 Observed Turbidity Levels

Table 6 lists the average turbidity values recorded from July 31, 2008 to September 30, 2008. These values show that the turbidity level was lower on the west side of the dike (stations W1 to W4) than on the east side (stations NE1 to NE3 and SE1 to SE3). The average turbidity levels at HVH3 were higher than those at HVH1 and HVH2.

Table 6: Average Turbidity Levels Recorded on July 31, 2008 to September 30, 2008

Station	Turbidity (NTU)	
	Average at Surface	Average of Observed Maximum
W1	18	25
W2	18	26
W3	17	26
W4	17	25
NE1	29	92
NE2	28	47
NE3	24	34
SE1	27	28
SE2	42	69
SE3	44	441
HVH1	23	27
HVH2	18	19
HVH3	38	52

The recorded turbidity level varied over time. Figures II1 to II13 in Appendix II show the variations at all monitoring stations. The highest turbidity levels were observed at stations NE1 and SE3 (see Figure II.5 and II.10). Turbidity was appreciably high only once at stations NE2 and SE2 (*i.e.,* 1400 and 1300 NTU, see Figures II.6 and II.9). All other observations at stations NE2 and SE2, and those at stations with relatively low turbidity levels (*i.e.,* W1 to W4, NE3, SE1 and HVH1 to HVH3), did not exceed 200 NTU.

Consistently low turbidity levels were observed at all stations from July 31 to approximately August 7 to 10. Subsequent turbidity level measurements varied greatly on a daily basis and/or remained relatively high until the end of August. Gradually descending turbidity levels were observed in September.

An observation that turbidity barriers were not functioning as intended was made in a daily field report on August 11, 2008 (Golder 2008c). On that date, the rockfill placement at the East-Dike was completed up to chainage 60+550. The East Dike centerline profile (Golder 2008a) indicates that the deeper lake bottom occurs approximately between chainages 60+400 and 60+550. As noted above, soft sediment pockets tend to be found in deeper lake sections (see Figure 9).

Figure 12, which shows average turbidity levels observed from July 31, 2008 to September 30, 2008, illustrates that the measured turbidity levels varied with depth. At any given station, the higher turbidity levels were typically observed at greater depths. The differences between surface and deep measurements were:

- Appreciable when turbidity levels were relatively high, from August 11 to 31 (see Appendix III, Figures III.1 to III.4, for profiles observed on August 14, 16, 18 and 23); and
- Less noticeable when turbidity levels were relatively low (see Appendix III, Figures III.5 and III.6, for profiles observed on September 5 and 8).

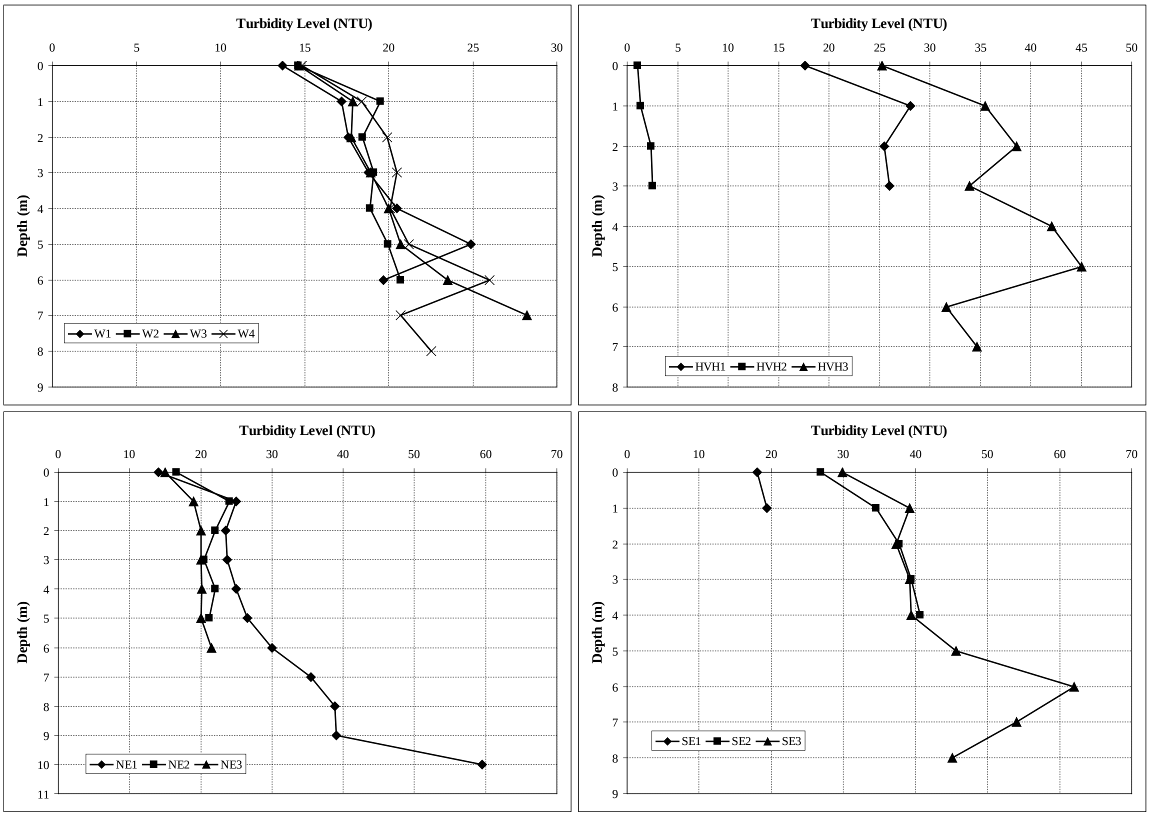


Figure 12: Observed Variation of Average Turbidity (July 31 to September 30) with Depth

3.4 Conclusions

The following conclusions are made based on the above analysis of the physical processes causing sediment entrainment and transport in Second Portage Lake during East Dike construction, and the observed turbidity levels at the monitoring stations:

- Lakebed sediments were the most likely source of suspended solids in water due to their relatively large fraction of fine particles (see Figure 8).
- The construction activity with the greatest potential for entraining solids in water was most likely rockfill placement and excavation. Among all activities, rockfill placement involved the largest amount of materials added into the lake and caused solid entrainment in the water column from the contact between the falling materials and the lake bed.
- The amount of solids entrained into the water depended on the thickness of the layer of fine lakebed sediments in the vicinity of the construction activities. The thicker the layer, the more solids entrained to the water column.
- It is mostly likely that a thicker layer of finer solid particles will be present in deeper areas of the lake, where finer particles tend to settle and accumulate naturally.

- The East Dike centerline between chainages 60+400 and 60+550 is located in a deeper area of the lake (see Figure 9). This area was most likely to have caused a large sediment loading to the water.
- It is assumed that the turbidity barriers extended from the lake surface to 1 m above the lakebed except in areas where the water depth was less than 2 m. Therefore, water and suspended solids were free to move underneath bottoms of the barriers.
- A free space was provided underneath the barriers to allow water flow between the construction area and remainder of the lake. The barriers were made of vinyl, which is an impervious material. Eliminating the free space, or extending the barriers from the lake surface to the bottom across the entire alignments, could result in a failure of the barrier due to submergence or ripping.
- Watershed runoff inflows and wind conditions at the lake were mostly likely to have preferentially induced lake currents to move from west to east. As a result, the turbidity levels were observed to be comparatively higher at monitoring stations located to the east of the dike (NE2, NE3, SE1, SE2, and particularly NE1 and SE3).
- Compared to all other stations, NE1 and SE3 are located at relatively deep areas of Second Portage Lake (see Figure 11). Highest turbidity levels observed at these two stations indicate that sediment loading to the water column was most likely to be the highest in the deepest portions of the lake, and the deepest portions of the lake near the barriers were most likely to have the highest turbidity levels.
- Lower turbidity levels observed at stations HVH1 to HVH3 compared to stations NE1 to NE3 and SE1 to SE3 are likely attributed to solid settling and dispersion of suspended solids. Station HVH3 was located within a bathymetric channel conveying water that would have passed through the area monitored by station SE3. The relatively high turbidity levels at station HVH3 compared to those at station HVH1 and HVH2 likely reflect the comparatively high turbidity levels observed at station SE3.
- Relatively high turbidity levels persisted from August 7 to 31 and coincide with the following construction activities: rockfill placement, excavation, and coarse filter placement.

4.0 BAY-GOOSE DIKE CONSTRUCTION AREA

This section describes the proposed methods for deployment of turbidity barriers during construction of the Bay-Goose Dike. TSS control measures during construction of South Camp Dike are briefly discussed. This section also includes recommendations for a field survey to collect additional data to evaluate the final location of the turbidity barriers at the Bay-Goose Dike construction area.

4.1 Turbidity Barriers for Bay-Goose Dike Construction

4.1.1 Deployment Methods

Similar to the construction of East Dike in Second Portage Lake, the fine lakebed sediments, especially in the deep areas of Third Portage Lake, are expected to be entrained into the water column during construction of Bay-Goose Dike. However, the construction area required for building Bay-Goose Dike represents a relatively small portion of Third Portage Lake. Therefore, it is anticipated that turbidity barriers can be successfully deployed to enclose the construction area and be extended to the bottom of the lake for most of their deployment.

Figures 13 and 14 show the proposed configurations of turbidity barriers for the Bay-Goose Dike construction. It is assumed that Bay-Goose Dike would be built in two stages over two open water seasons. Figures 13 and 14 show the opening locations, where the barriers would not cover the full water depth. These openings would allow exchange of low turbidity level water between the enclosed construction areas and the remainder of Third Portage Lake.

North Section of Bay-Goose Dike

The proposed turbidity barriers for the north section of Bay-Goose Dike would extend to the bottom of the lake, except for the openings shown on Figure 13. During the period when the construction activities would occur at the northern portion of this dike, only the openings to the south would be active and the north openings would be closed. This would maximize the travel time for the entrained solids and provide additional opportunity for them to settle before leaving the area enclosed by the barriers. Similarly, during the period when the construction activities would occur at the southern portion of this dike, only the openings to the north would be active and the south openings would be closed.

South Section of Bay-Goose Dike

The proposed turbidity barriers for the south section of Bay-Goose Dike would be extended to the bottom of the lake, except for the openings shown on Figure 14. During the period when the construction activities would occur at the eastern portion of this dike, only the openings to the west would be active and the east openings would be closed. This would maximize the travel time for the entrained solids and provide greater settling opportunity. Similarly, during the period when the construction activities would occur at the western portion of the dike, only the openings to the east would be active and the western openings would be closed.

4.1.2 Operational and Design Considerations

Compared to other possible turbidity control measures (*e.g.,* dredging), turbidity barriers are relatively inexpensive and easy to implement, and do not require the subsequent handling and treatment of large volumes of water and solids. However, turbidity barriers do require continuous maintenance to retain their effectiveness.

A barrier could be damaged by the action of lake currents or be pulled into the water (*i.e.,* submerged) due to the weight of sediment that could potentially accumulate at its base. The barriers will require constant inspection and any compromised sections of would have to be replaced as soon as damage or submergence is noticed.

A turbidity barrier is a temporary structure and should be designed to sustain the pressure of lake currents induced by a 10-year return period design wind event. This criterion should be applied to determine the number of anchors required in the deployment of the turbidity barriers. The distance between the dike and the barrier should be decided in part based on the lake bathymetry. Deployment should be avoided on the face of steep slopes to prevent the potential accumulation of sediment at the foot of the barrier. Consideration of the presence of high value fish habitat may also be required. Custom built (Type 2 or 3 DOT) barriers would be needed for the deep portions of the lake to the east of Bay-Goose Dike.

4.1.3 Options for Deployment of Additional Barriers

Additional barriers may be deployed as follows (see Figures 13 and 14):

- Secondary rows of turbidity barriers could be placed along the footprint of Bay-Goose Dike to further constrain the movement of suspended solids within the construction area; and
- Lateral rows of turbidity barriers could be placed to increase the length of flow pathways within the construction areas.

Both options, if implemented, are intended to promote or enhance settling of suspended solids within the construction area. The secondary and lateral barriers would not extend over the full depth to allow water movement within the construction area. Final deployment locations of the barriers would be determined based on the results of the field survey proposed in Section 4.3. Furthermore, adjustment to the final locations may be required based on the site conditions at the time of the deployment.

4.1.4 Required Inventory of Turbidity Barriers

Turbidity barrier are manufactured in segments of typical length and by increment of depths. Table 7 lists the number of segments required to implement the proposed turbidity barriers, including the secondary and lateral barriers proposed in Figures 13 and 14. A segment length of approximately 15 m (50 ft) is assumed. This is the most common segment length in the inventory of turbidity barriers currently on site (Ryan Vanengen, AEM, Personal Communication, Nov. 16, 2008). Depths are presented in increments of approximately 1.5 m (5 ft) up to a depth of 12 m, and increments of 3 m (10 ft) for segments deeper than 12 m.

The quantities in Table 7 are based on the assumption that the turbidity barriers are extended to the full water column depth. A free depth of at least 1 m is considered for the secondary and lateral barriers, except where the depth is less than 1.5 m. The secondary and lateral barriers do not include any segment deeper than 12 m. The quantities listed in Table 7 do not include spare segments that might be required to replace damaged portion of the deployed barriers or section off the South Camp Dike construction area (see Section 4.2 below).

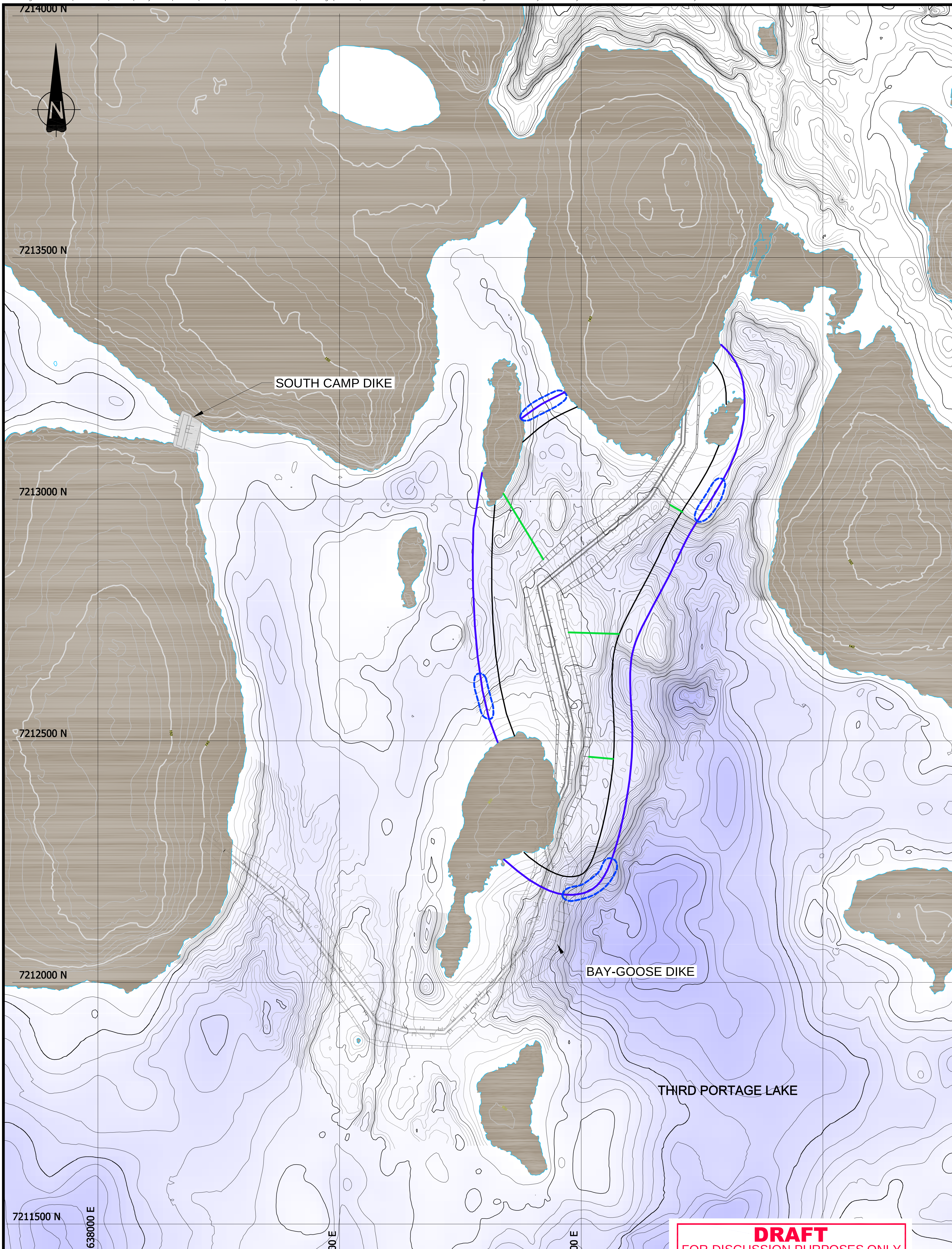
Table 7: Estimates of Required Turbidity Barrier Segments

Depth (m)	Length (m)							Number of Turbidity Barrier Segments [1]
	North Section of Bay-Goose Dike			South Section of Bay-Goose Dike				
	Turbidity Barriers	Secondary Turbdity Barriers	Lateral Turbdity Barriers	Turbidity Barriers	Secondary Turbdity Barriers	Lateral Turbdity Barriers	Total	
1.5	450	510	0	195	240	315	1710	114
3.0	210	240	60	450	375	0	1335	89
4.6	105	300	315	300	270	0	1290	86
6.1	180	180	0	225	285	0	870	58
7.6	360	495	0	165	150	0	1170	78
9.1	315	60	0	135	225	0	735	49
10.7	120	0	0	45	75	0	240	16
12.2	300	0	0	150	315	0	765	51
15.2	0	0	0	75	0	0	75	5
18.3	0	0	0	105	0	0	105	7
21.3	0	0	0	135	0	0	135	9
24.4	0	0	0	60	0	0	60	4

1. The length of a segment is 15 m.

4.2 South Camp Dike

The South Camp Dike is planned to be built in the winter in an area where ice cover is anticipated to extend to the lakebed, and negligible to no exchange of water is expected between the construction area and the lake. Therefore, the deployment of turbidity barriers is not anticipated to be necessary during South Camp Dike construction. Nevertheless, additional turbidity barriers should be maintained on site and deployed if required. The deployment would follow the methods described in Section 4.1.1.



DRAFT
FOR DISCUSSION PURPOSES ONLY

NOT FOR CONSTRUCTION

LEGEND

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval
- Turbidity Barrier
- Proposed Location of open Barrier
- Secondary Turbidity Barrier
- Lateral Turbidity Barrier

0 75 150 225 300 375
SCALE IN METRES

NOTES

1. All contours are expressed as elevations.

REFERENCES

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

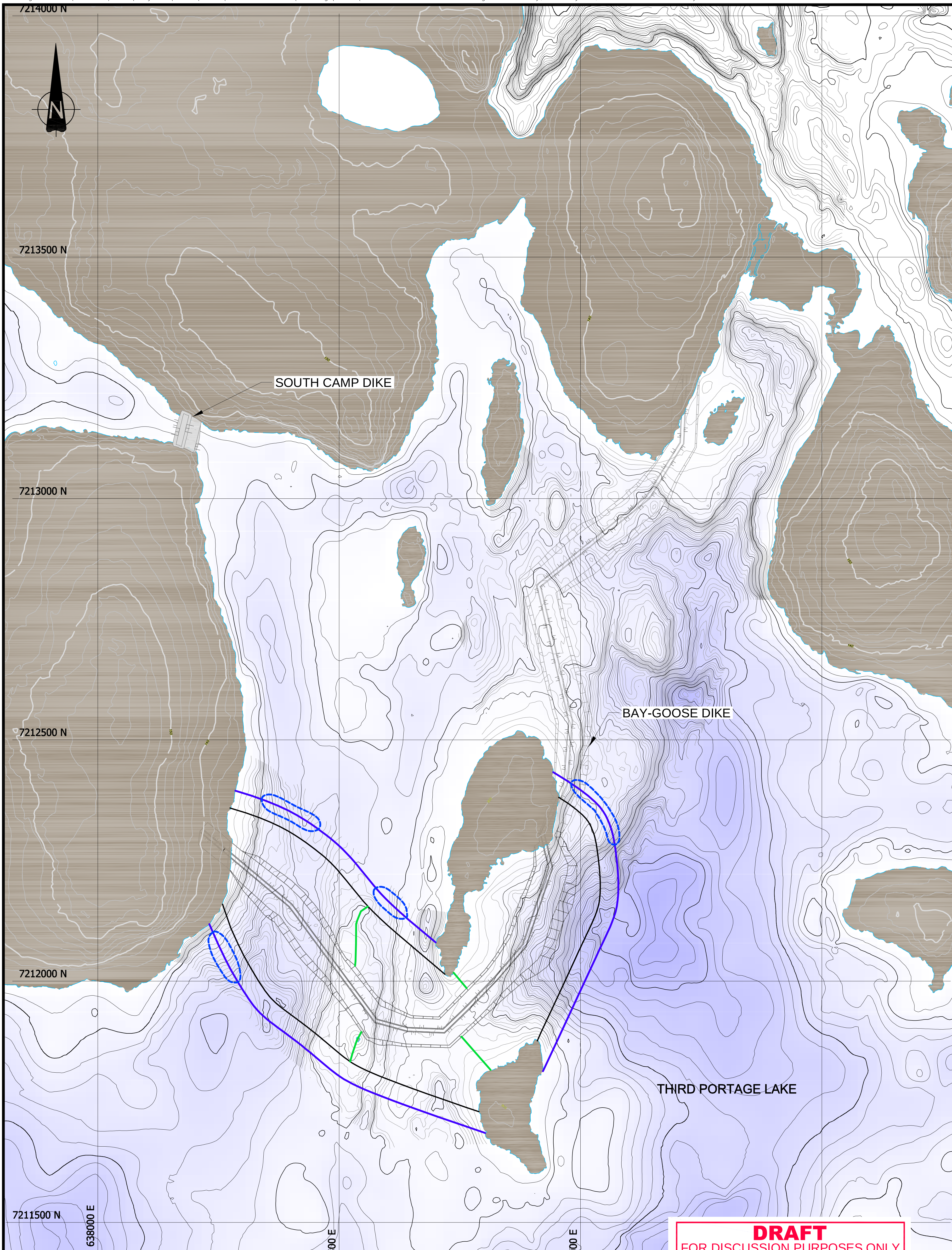
PROJECT
AEM
AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE
PROPOSED TURBIDITY BARRIER LOCATION FOR BAY-GOOSE DIKE - NORTH SECTION

Golder Associates
Greater Vancouver Office, BC

PROJECT No.	081428-0028	PHASE No.	6000
DESIGN	KD	17OCT08	SCALE AS SHOWN REV. –
CADD	JK	19DEC08	
CHECK			**FIGURE 13**
REVIEW			

Drawing File: N:\Bur-Graphics\Projects\2008\1428\08-1428-0028\Drafting\6000\0814280028-6000-15_A.dwg Wednesday, January 28, 2009 9:41:25 AM By: ASalvador



DRAFT
FOR DISCUSSION PURPOSES ONLY

NOT FOR CONSTRUCTION

LEGEND

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval
- Turbidity Barrier
- Proposed Location of open Barrier
- Secondary Turbidity Barrier
- Lateral Turbidity Barrier

0 75 150 225 300 375
SCALE IN METRES

NOTES

1. All contours are expressed as elevations.

REFERENCES

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

PROJECT

AEM

AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE

PROPOSED TURBIDITY BARRIER LOCATION FOR BAY-GOOSE DIKE - SOUTH SECTION

Golder Associates
Greater Vancouver Office, BC

PROJECT No.	081428-0028	PHASE No.	6000
DESIGN	KD	17OCT08	SCALE AS SHOWN	REV. –
CADD	JK	19DEC08	
CHECK			
REVIEW			

FIGURE 14

4.3 Proposed Field Survey

The effectiveness of the proposed turbidity barriers as a turbidity control measure to meet the regulatory requirements depend on the characteristics, volume and spatial distribution of the fine lakebed sediments in the Bay-Goose Dike construction area.

Therefore, a field survey to characterize the fine lakebed sediments at Third Portage Lake is required to support the selection and finalization of the TSS control measures for the Bay-Goose Dike construction area. The survey should include quantification of fine sediments within the dike footprint where sediment pockets would be expected (see Figure 15 for proposed survey locations). Samples of fine lakebed sediments should be taken at these locations and analyzed to determine grain size distribution, organic content and specific gravity. The sampling technique employed should minimize loss of the collected soil when the samples are lifted from the bottom of the lake to the water surface.

The survey data on the sediment thickness and the grain size distribution would be used to estimate the volume of particles that could potentially be entrained to the water column. The organic content and specific gravity would be used to estimate the sediment settling capacity. The information gained would be used to optimize the proposed turbidity control measures (*e.g.,* number and location of turbidity barriers).

A monitoring program will be implemented to measure turbidity level within Third Portage Lake during the construction of the Bay-Goose Dike. This program will be reviewed and refined, if needed, based on the deployment location of the turbidity barriers.

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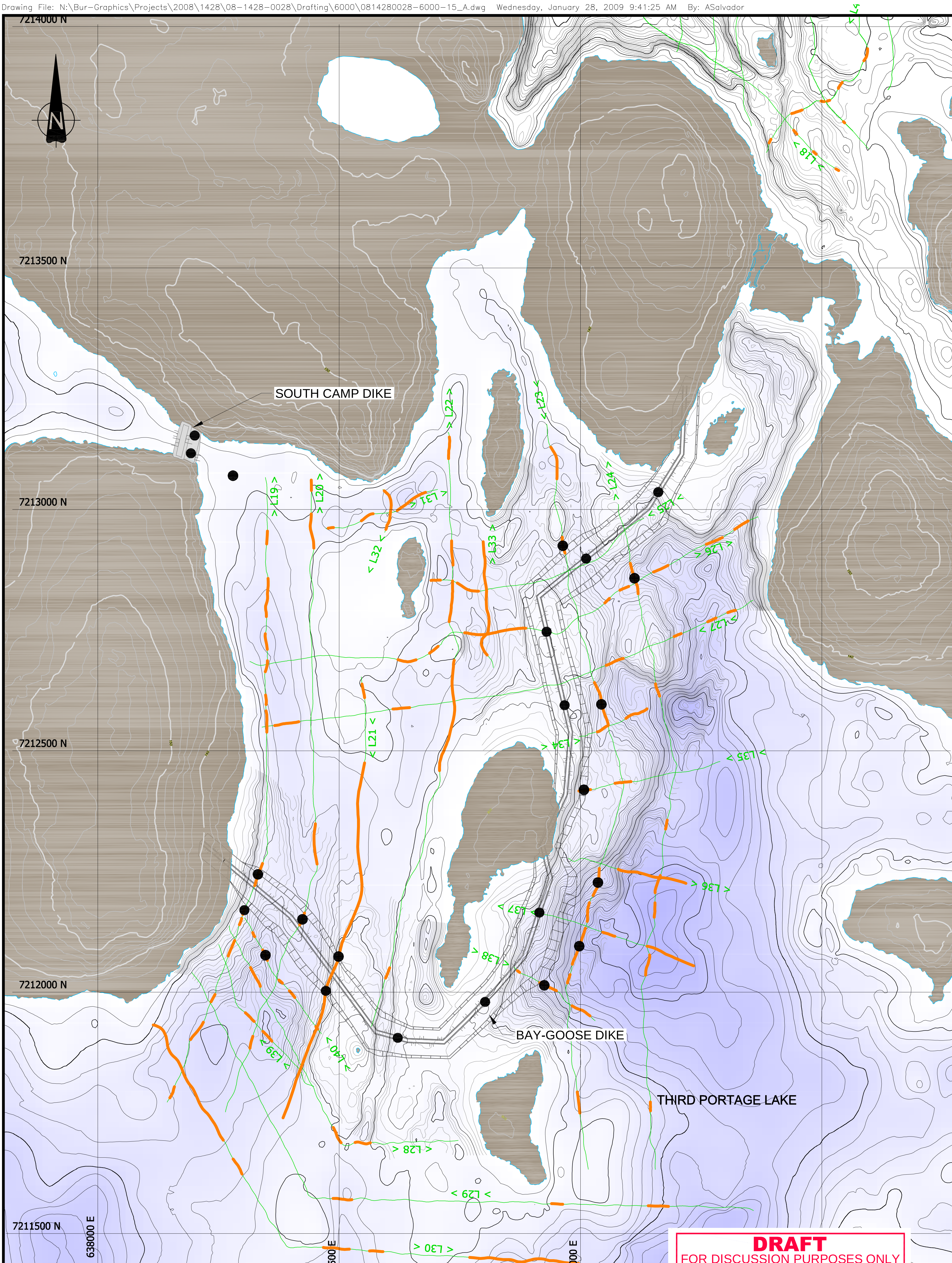

DRAFT
FOR DISCUSSION PURPOSES ONLY

NOT FOR CONSTRUCTION

LEGEND

- Lake Bottom Elevation, 10m Interval
- Lake Bottom Elevation, 2m Interval
- Lake Bottom Elevation, 0.5m Interval
- Shoreline
- Topography Elevation, 10m Interval
- Topography Elevation, 2m Interval
- Seismic Survey Line
- Approximate Sediment Sampling location
- Approximate location of Fine Sediment Pocket

0 75 150 225 300 375
SCALE IN METRES

NOTES

1. All contours are expressed as elevations.

REFERENCES

1. Bottom elevation data is combined from surveys in 2002, 2003, 2006, 2008.
2. Datum: NAD83 Projection, UTM Zone 14N.

PROJECT

AEM

AGNICO-EAGLE MINES LIMITED
MEADOWBANK DIVISION

TITLE

PROPOSED SEDIMENT SURVEY LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No.	081428-0028	PHASE No.	6000
DESIGN	KD	17OCT08	SCALE AS SHOWN REV. –
CADD	JK	19DEC08	
CHECK			**FIGURE 15**
REVIEW			

5.0 CLOSURE

This report was prepared and reviewed by the undersigned.

GOLDER ASSOCIATES LTD.

Prepared by: Reviewed by:

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APPENDIX I

Turbidity Measurements at Second Portage Lake (July 31, 2008 to September 30, 2008)

Table I.1: Turbidity Measurements at Station W1

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
31-Jul	13:41	2.0	2.1	2.1	1.6		2.2							
01-Aug	3:06	5.4												
01-Aug	6:25	3.7						4.4						
01-Aug	10:47	7.1		8.6										
01-Aug	23:59	10.8		10.6										
02-Aug	3:23	9.6	11.5											
02-Aug	5:23	5.3				6								
02-Aug	11:48	4.2			5.4									
02-Aug	16:07	6.1									6.1			
02-Aug	21:20	6.1				7.3								
03-Aug	2:38	3.2			5.7									
03-Aug	5:09	2.4				2.9								
03-Aug	11:42	2.5												
03-Aug	15:34	2.9												
03-Aug	21:16	3.2						3.7						
04-Aug	0:43	3.6							6					
04-Aug	4:52	3.8						3.8						
04-Aug	16:40	4.8							5.5					
05-Aug	0:34	4.6									7.8			
05-Aug	5:32	3.8								5.6				
05-Aug	17:12	3.8							5					

APPENDIX I
TURBIDITY MEASUREMENTS AT SECOND PORTAGE LAKE
(JULY 31, 2008 to SEPTEMBER 30, 2008)

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
05-Aug	21:32	4.2												
06-Aug	1:31	3.3					4							
06-Aug	5:14	5.1												
06-Aug	15:16	6.2									9.7			
07-Aug	4:34	21.7												
07-Aug	10:56	13.7							18.1					
07-Aug	16:38	13.6							35.9					
07-Aug	20:52	13.5								21				
08-Aug	5:03	14.7	18.6											
08-Aug	9:50	14.2							37					
08-Aug	14:57	12.8									13.9			
08-Aug	16:29	12.7	13.9	16.1	13.8		13.2		14.8		16.5			
08-Aug	19:31	11.5	12.8	12.8	12.9		12.9		11.9		22.4	28.9	44.3	45
08-Aug	22:13	11.3	12.4	14.3	14.5		12.9		13.1					
09-Aug	6:29	10.4	11.8	11.4	16.5		32		39					
09-Aug	11:29	15.3	14.5	13.4	15		14.3		21.3					
09-Aug	15:47	17.4	17	16.4			21.6		26	32				
09-Aug	17:05	29.1	32	28	26.4		30		47		52.2			
09-Aug	20:25	22.4	21.4	23	21.2		32.6		32.9		38.5			
09-Aug	21:48	20.7	20.4	20.4	22.7		26		30.9					
10-Aug	5:05	29.1									52.2			
10-Aug	9:48	20.7							30.9					

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
10-Aug	14:44	10.9	11.9	13.6	19.9		21.2		22.3		19.7			
10-Aug	17:49	9.7	9	12.9	9.3		11.6		16.5	19	22.6			
10-Aug	20:37	8.1	8.4	9.3	9.8		10.5		11.8					
11-Aug	5:20	8	8.2	7.3	8.4		11.3		13.4					
11-Aug	10:01	7	7	7	7.8		7		7					
11-Aug	15:05	11	11	12	10		35		140					
12-Aug	9:19	17.5	19.5	18.4	22		25.3		27					
12-Aug	12:00	28	27.1	25.5	28.5		31.5		45		54.2			
12-Aug	23:28	10	10	10.5	10.5		10.5		12.5					
13-Aug	7:20	17	20	21	26		26		26		54			
13-Aug	12:27	19	17	16	20		20		33		37			
13-Aug	18:56	18.5	17.4	18.9	21.5		22.6		23.3					
13-Aug	22:49	13.3	12.7	13.1	13.5		14.3		15.6					
14-Aug	9:50	12	15	14	13		13		13		15			
14-Aug	16:07	37	32	35	44		44		42					
14-Aug	21:00	67	70	74	109		109		109		120			
16-Aug	5:55	54	41	44	51		51		50		54			
16-Aug	19:27	43	43	41	42		42		66		80			
17-Aug	5:58	33	36	37	41		41		41		43			
17-Aug	16:20	42	40	43	36		38		39		40			
17-Aug	19:34	43	41	40	41		38		35					
18-Aug	6:12	43	41	43	41		41		44					

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
18-Aug	19:41	34	37	37	39		41		46					
19-Aug	15:58	41	41	42	50		53		51					
20-Aug	10:53	44	43	43	38		36		37					
20-Aug	14:28	46	48	49	49		43		50		50			
20-Aug	19:31	50	50	51	50		52		52					
21-Aug	11:41	36	33	41	36		44		34					
21-Aug	17:22	37	32	34	33		33		32		34			
22-Aug	16:58	32	30	32	30		33		36					
23-Aug	11:50	26	30	30	30		29		30					
24-Aug	11:04	28	28	34	29		28		34					
24-Aug	17:07	26	29	32	29		26		26					
25-Aug	9:35	31	31	30	30		30		32		31			
25-Aug	16:33	29.1	27.1	28.2	28.1		28.3		28.5		29.1			
28-Aug	10:12	20	18.6	18.8	18.8		19.3							
29-Aug	10:46	19.6	22.5	20.3	20.4		20.5		20.2		20.3			
30-Aug	15:42	27.5	24.5	33.8	32.5		29.1		32.4					
31-Aug	10:31	23.1	23.1	23.5	23.8		24		24.9					
01-Sep	10:53	17.9	18.7	17.9	19.1		18.7							
02-Sep	10:22	19.1	16.3	17.3	18.5		18.2		20.4					
03-Sep	10:47	16.7	17.7	19.6	16.2		18.7		16		17.5			
04-Sep	14:09	15	15.1	15.6	15.8		15.9		16.3		14.9			
05-Sep	9:34	13.7	14.5	15.6	14.5		14.5		15.8					

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
06-Sep	15:08	12.6	12.4	13.1	12.2		13.6		14.1					
07-Sep	9:52	14.1	15.8	15.3	16.2		16.5		16					
08-Sep	16:10	14	15	13	16		15		15		15			
09-Sep	10:34	14	15.7	14	13.6		14.1		16.6		19.6			
10-Sep	9:51	14	14	14	14		13		14					
12-Sep	9:35	13	13	13	14		14		13		13			
13-Sep	9:32	13	13	12	12		12		12		13			
14-Sep	8:24	12	12.2	11	12		11.6		12		11.7	23		
17-Sep	9:44	11	11	11	11		12		12		12			
18-Sep	10:21	11	11	10.5	11.5		11		11		10			
19-Sep	8:06	10	10	10	10		10		11		11			
21-Sep	8:59	8.9	9.4	9.5	10.3		9.8							
23-Sep	10:38	8.9	8.8	9.8	9.8		9.9		10.4					
25-Sep	8:44	9.6	9.5	10.1	9.3		10.5		9.7		10.5			
27-Sep	10:10	14.5	15.3	19.5	16.3		16.8		17.5		16.9			
28-Sep	8:53	15.7	15.3	15.4	15.1		15.3		16.6					
29-Sep	8:59	25.4	25	26.5	28.6		27.6		29.7					
30-Sep	9:49	29.8	29	27.8	30.1		32.1		32.9					

Table I.2: Turbidity Measurements at Station W2

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
31-Jul	15:05	3.7	3.8	3.5	3.7		3.7		4.1		4.3			
01-Aug	3:04	4.2												
01-Aug	6:21	1.1									2			
01-Aug	10:50	1.2							1.6					
01-Aug	23:55	2.6								4.4				
02-Aug	3:19	2.9					4.8							
02-Aug	5:28	3.2							10					
02-Aug	11:52	6.2		7.5										
02-Aug	16:10	6									7.4			
02-Aug	21:15	4.8									9.5			
03-Aug	2:34	2.1									3.8			
03-Aug	5:06	2.4									3			
03-Aug	11:45	2.6										3.3		
03-Aug	15:33	2.9									7.9			
03-Aug	21:13	3.5								8				
04-Aug	0:40	4.3									8			
04-Aug	4:49	3.8						5.4						
04-Aug	16:49	4.5									13.5			
05-Aug	0:30	4												
05-Aug	5:23	3.8									5.5			
05-Aug	17:16	3.5							4					

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
05-Aug	21:21	3.5				4								
06-Aug	1:28	5.4				7.7								
06-Aug	5:12	6.7												
06-Aug	15:20	10.9					11.5							
07-Aug	4:32	15.1								27.6				
07-Aug	10:59	19.7									29.6			
07-Aug	16:40	14.8							16.8					
07-Aug	20:50	15.6			20.1									
08-Aug	5:01	9.7						16.1						
08-Aug	9:52	14.7							15.5					
08-Aug	15:00	14.5									16.4			
08-Aug	16:26	12.5	16.9	15.2	13.3		10		9.8		12.4			
08-Aug	19:28	11.9	14	14.8	11.6		12.6		10.4		14			
08-Aug	22:10	10.3	11.8	12.4	12.1		11		14.6		96			
09-Aug	6:34	12.4	11.6	13.5	9.1		11.2		14.5		52.4			
09-Aug	11:34	23.4	19.9	21.1	24.7		24.5		31.8		77			
09-Aug	15:44	23	23	24	28		34		36.5	44				
09-Aug	17:01	21.5	24.5	23	26		27		27		34			
09-Aug	20:21	17.8	17.5	16.4	16.7		19.7	18.5	41	46.1	44.8	47.9		
09-Aug	21:51	18.4	20	19.6	17.9		18.9		20.5		20.3			
10-Aug	5:01	21.5									34			
10-Aug	9:51	18.4									20.5			

Date	Time (24 hr)	Depth (m)												
		0.0	1.0	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0
10-Aug	14:48	9.1	8.4	8.7	10.1		14		14.9		14.5			
10-Aug	17:52	8	8	8.4	12.4		12.2		11.8		13.4			
10-Aug	20:34	8.2	6.9	7.8	7.5		12.3		12.5		14.4	15.1		
11-Aug	5:15	7.5	7.1	7.8	8.2		9.4		18.8		46.5			
11-Aug	10:06	7.1	7.1	7.3	8.1		9.3		8.1		11			
11-Aug	15:00	12	10	11	15		20		20		50			
12-Aug	9:25	20	18	18.3	19.7		20.1		22.1		31.9			
12-Aug	12:07	22.5	24	25.5	22.8		24.7		23		21.1			
12-Aug	23:23	11.5	12	12	13		13		13.5		13.5			
13-Aug	7:14	20	20	23	23		21		27		31	34	34	32
13-Aug	12:35	21	23	16	15		14		20		21	45		
13-Aug	18:59	14.3	15.6	16.1	15.1		15		16.1		28.1			
13-Aug	22:43	13.9	14.5	14	13.3		14.3		15.1		29			
14-Aug	9:45	16	15	17	18		17		15		46			
14-Aug	16:12	50	50	53	57		64		90		110			
14-Aug	21:08	59	67	62	55		60		65		69			
16-Aug	5:50	34	39	38	39		42		42		50			
16-Aug	19:32	44	42	38	43		41		45		50			
17-Aug	5:54	30	33	33	34		31		32		39			
17-Aug	16:25	41	41	39	41		50		48		53			
17-Aug	19:39	42	46	43	52		43		38		46			
18-Aug	6:06	45	40	45	43		39		46		46			

Date	**Time (24 hr)**	**Depth (m)**												
		0.0	**1.0**	**2.0**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**	**7.0**	**8.0**	**9.0**
18-Aug	19:46	39	39	37	43		42		42		44	60		
19-Aug	15:47	35	46	42	46		55		53		51			
20-Aug	10:47	54	47	53	48		47		42		45			
20-Aug	14:37	56	58	59	59		52		65		61	66		
20-Aug	19:37	47	51	50	50		50		50		57			
21-Aug	11:38	40	44	38	42		45		44		51			
21-Aug	17:16	42	45	42	40		45		48		48	52		
22-Aug	17:03	37	36	37	36		35		38					
23-Aug	11:55	32	32	28	30		32		27		32			
24-Aug	11:09	27	28	34	30		27		28		32			
24-Aug	17:12	26	33	27	26		26		27		33			
25-Aug	9:40	33	34	32	33		33		33		32	34		
25-Aug	16:38	26.4	27.8	28.5	37.6		26.9		27		30.4	32.8		
28-Aug	10:08	20.6	20.6	20.1	21.3		19.3		19.9		19.3			
29-Aug	10:52	21.8	25.2	21.9	20.6		21.3		23.4					
30-Aug	15:39	30.7	27.4	30.3	26.9		29.6		28.2					
31-Aug	10:26	24.4	23.3	23.4	23.8		23.4		28.3					
01-Sep	10:49	18.3	19.6	20.4	21.8		22.3		21		20.9			
02-Sep	10:19	17.3	19.5	21.1	21.2		17.6		17.6		19			
03-Sep	10:42	17.4	17.5	18.6	18.5		18.3		17.9		17.2			
04-Sep	14:04	16.2	16.2	15.9	16.3		15.7		15.6		15.8	16.3	18.9	
05-Sep	9:24	14.2	16.6	15.4	17		15.9		16.3		15.5			

Date	Time (24 hr)	Depth (m)												
		0.0	**1.0**	**2.0**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**	**7.0**	**8.0**	**9.0**
06-Sep	15:04	12.3	14.2	12.4	12.3		12.9		12.8		13.3			
07-Sep	9:49	16.8	16.6	16.1	16.1		17.7		16.3		15.8			
08-Sep	16:12	14	14	15	14		14		14		14			
09-Sep	11:01	15.9	15.4	14.1	15.4		15.2		15.5		15.1	16.2		
10-Sep	9:58	14	14	14	15		14		15		15			
12-Sep	9:42	13	14	13	14		14		13		12	13		
13-Sep	9:39	12	14	14	13		13		14		13			
14-Sep	8:31	11.4	10.8	11.6	11.7		11.6		11.8		11.9			
17-Sep	9:48	12	12	13	12		13		13		13	12		
18-Sep	10:29	12	11	11	11		10		11		11	11		
19-Sep	8:13	10	10	10	10		11		11		11	11		
21-Sep	9:03	8.7	9.4	9.7	9.5		9.7		8.7					
23-Sep	10:35	10.6	10.2	9.9	9.8		9.4		9.7		10.7	9.8		
25-Sep	8:47	8.9	9.6	9.5	9.4		9.5		9.7		10.1			
27-Sep	10:13	19.6	17.9	17.6	17.7		18.5		21.6		19.3			
28-Sep	8:50	16.1	16.3	16.5	14.8		15.2		16.4		17.3			
29-Sep	8:56	21.7	20.7	24.4	22.6		21.6		23.7		23.3			
29-Sep	15:48	22.7	24.9	23.7	22.9		22.5		23.4		22.4			
30-Sep	9:53	27.9	28.9	27.6	32.6		36.9		30.7		31.6	29.9		

Table I.3: Turbidity Measurements at Station W3

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	1.5	2.0	3.0	3.5	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5
31-Jul	15:11	2.3		2.1		2.4	2.4		3	2.3	2		2.3			
01-Aug	3:05	4.2														
01-Aug	6:18	1														
01-Aug	10:54	1.5								1.7						
01-Aug	23:51	2.5										3				
02-Aug	3:16	3.3		3.4												
02-Aug	5:25	4		3.6												
02-Aug	11:56	8.4		10.3												
02-Aug	16:13	5.5											7.3			
02-Aug	21:12	6.1													8	
03-Aug	2:42	2.4								3.3						
03-Aug	5:03	2.6											3			
03-Aug	11:49	2.6													10.5	
03-Aug	15:44	2.9													10.6	
03-Aug	20:49	2.7													11	
04-Aug	0:32	2												9		
04-Aug	4:46	3.2														7.3
04-Aug	16:54	3.1													7.8	
05-Aug	0:25	4.8													7	
05-Aug	5:03	4.4														5
05-Aug	17:19	3.3											4.1			

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	1.5	2.0	3.0	3.5	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5
05-Aug	21:16	5.2														
06-Aug	1:26	5.7	7.3													
06-Aug	5:09	10			13											
06-Aug	15:22	7.9														
07-Aug	4:29	14.7								23						
07-Aug	11:04	16.7							21.2							
07-Aug	16:47	13.5											21.7			
07-Aug	20:45	19.1										21				
08-Aug	4:58	9.9						12.3								
08-Aug	9:54	13.5											49			
08-Aug	16:23	14.7				12.3	12.6		11.4	12.1	11.1					
08-Aug	19:26	11.6		12.5		12.1	11		10.9	11.3	13					
08-Aug	22:06	7.5		8.5		10.9	13.2		11.2	20.1	7.5		45.5			
09-Aug	6:38	11.8		11.3		11.3	11.3		10.9	28.2	35.4		51.2			
09-Aug	11:38	18		17.7		18.8	20.2		19.1	20.7	52.8		62.5			
09-Aug	15:40	36		36		40	41		39	36	36	64	59		95	
09-Aug	16:58	20		20		24	21.1		21.1	22	28.4		35.6			
09-Aug	20:17	18.4		16		16.3	15.3		21.6	33.5	36.9	43				
09-Aug	21:55	15.5		15.3		16	15.3		15.6	17.5	17.6		16.3			
10-Aug	4:58	20											35.6			
10-Aug	9:55	15.5											17.6			
10-Aug	14:56	10.5		9.9		9	8.6		11.1	11.2	11.2		11.2		17.8	

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	1.5	2.0	3.0	3.5	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5
10-Aug	17:55	7.5		7.7		8.1	8		7.9	9.4	9.9		18		18.1	
10-Aug	20:28	8		8.8		6.8	7.8		8.5	9.8	13.7	12.7	17.1			
11-Aug	5:08	7.1		7.3		7.1	7.5		7.6	10.8	35.2		20.6			
11-Aug	10:11	7		7.4		7.5	7.9		7.9	9.3	43.3		58.7			
11-Aug	14:45	18		18		23	21		23	27	54		100			
12-Aug	9:30	19.1		18.1		20.1	21.2		22.2	22.4	23.4		27			
12-Aug	12:14	17.5		20.5		24.5	24.5		25.5	23.5	23		22.4			
12-Aug	23:18	13		13		14	13		13	17.5	16		19			
13-Aug	7:05	21		23		23	21		27	31	34		34		32	
13-Aug	12:58	16		13		14	16		18	21	25		27		30	
13-Aug	19:02	16		15.1		16	14.7		14	14.5	23.5		28.5			
13-Aug	22:38	13.3		14.3		14.5	14.2		14.2	17.5	25		36.5			
14-Aug	9:41	14		17		15	15		20	52	61		59			
14-Aug	16:17	37		41		45	46		48	58	54		107			
14-Aug	21:14	45		43		43	47		48	47	50		61			
16-Aug	5:43	31		27		29	30		30	31	32					
16-Aug	19:37	40		33		39	42		43	38	39		35			
17-Aug	5:48	39		37		39	39		39	38	37					
17-Aug	16:30	43		42		43	42		45	46	47		50			
17-Aug	19:47	40		47		42	43		40	48	50					
18-Aug	5:58	37		32		35	36		34	36	40		40			
18-Aug	19:55	37		39		37	38		39	40	48	46				

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	1.5	2.0	3.0	3.5	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5
19-Aug	15:40	37		32		42	42		43	43						
20-Aug	10:40	53		42		61	61		51	47	48					
20-Aug	14:43	54		58		56	50		50	56	60					
20-Aug	19:45	46		48		47	49		51	47	50					
21-Aug	11:27	36		37		40	48		43	43						
21-Aug	17:12	43		42		45	42		48	48	47					
22-Aug	17:09	38		35		36	33		34	30						
23-Aug	12:00	29		32		31	33		30	31	30					
24-Aug	11:15	27		26		30	33		27	27	35					
24-Aug	17:16	26		31		30	28		34	29	30		30			
25-Aug	9:46	32		33		28	32		31	28	32					
25-Aug	16:42	30		28.3		30.1	29.6		26.6	30.3	27.6		28.2		27.4	
28-Aug	10:04	19.1		19.3		19.7	19		19	19	18.7		19.3		19.5	
29-Aug	10:56	20.9		18.9		18.2	18.5		20.8	18.3	21					
30-Aug	15:35	23.8		23.2		22.1	22.8		22.7	24.3	23.5		29.9			
31-Aug	10:22	23.4		24.7		25	27		27							
01-Sep	10:46	19.7		19.9		20.1	21.5		22.6							
02-Sep	10:16	18.7		21.5		21.8	21.9		21.5	20	20.4					
03-Sep	10:38	16.5		19.6		16.7	18		18.1	19.5						
04-Sep	14:00	16.5		16.4		15.9	16.2		15.6	16.5	17.4		17.3			
05-Sep	9:26	14.1		14.8		13.9	16.5		16.3	16.1	16					
06-Sep	15:02	13.8		13.3		12.8	13		12.8	13	12.5					

Date	Time (24 hr)	Depth (m)														
		0.0	**0.5**	**1.0**	**1.5**	**2.0**	**3.0**	**3.5**	**4.0**	**5.0**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**
07-Sep	9:45	14.6		16.6		15.7	15.7		15.6	15.6	16.1					
08-Sep	16:18	14		15		14	15		14	15	16					
09-Sep	11:09	15.6		16		14.4	15.5		14.7	15	14.6					
10-Sep	10:04	15		14		15	15		15	14	14					
12-Sep	9:47	12		12		12	13		12	12	13					
13-Sep	9:46	13		13		14	13		13	14	14					
14-Sep	8:37	11.6		11.7		11.7	11.4		11.3	11.7	11.6					
17-Sep	9:53	12		12		13	13		14	14	14		14			
18-Sep	10:39	11		11		11	11		11	11	11					
19-Sep	8:19	10		10		11	11		11	12	11					
21-Sep	9:08	9.1		9.6		9.2	9.9		9.2	9.5						
23-Sep	10:30	10.5		10		9.2	10.5		10.9	10.6	10.3		10.9		9.9	
25-Sep	8:50	9.7		9.5		9.6	9.6		9.9	9.4	9.8					
27-Sep	10:17	17.3		18.2		17.4	19.1		22.5	22.2	19					
28-Sep	8:48	17.4		16.2		16.7	18.9		19.2	17.5	16.6		19.9			
29-Sep	8:53	21.5		21.7		21.4	22.6		19.2	22.7	24.7		24.4			
30-Sep	9:56	30.9		26.1		28.9	28.1		27.6	31.7	30		30.4		31	

Table I.4: Turbidity Measurements at Station W4

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	2.0	3.0	3.5	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0
31-Jul	15:25	1.7		1.6	1.6	1.8		1.8	1.4		0.7		0.5		0.6	0.4
01-Aug	2:55	1.2														
01-Aug	6:15	1												14.3		
01-Aug	11:02	1.7													12.5	
01-Aug	23:45	3.2								4						
02-Aug	3:10	2.8								3.4						
02-Aug	5:21	2.3							2.9							
02-Aug	12:00	4.8											22			
02-Aug	16:19	4.5											8.9			
02-Aug	21:08	3.4									5.1					
03-Aug	2:30	3.1			3.7											
03-Aug	5:00	3.8	4.8													
03-Aug	11:52	2.4													5.7	
03-Aug	15:50	2.6											6.7			
03-Aug	20:43	3.2											5			
04-Aug	0:36	2.4									6					
04-Aug	4:43	3.1	3.5													
04-Aug	16:59	3.5						5.8								
04-Aug	22:15	4.6											5.4			
05-Aug	5:00	4.8													7.5	
05-Aug	17:23	10.3			11											

Date	Time (24 hr)	Depth (m)														
		0.0	**0.5**	**1.0**	**2.0**	**3.0**	**3.5**	**4.0**	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**9.0**
05-Aug	21:11	11.2														
06-Aug	1:24	9.5		10.7												
06-Aug	5:07	1.5								1.8						
06-Aug	15:27	7.5											8.9			
07-Aug	4:27	17.2														
07-Aug	11:07	7.9											13.8			
07-Aug	16:50	9.8											10.2			
07-Aug	20:42	15.7					21.3									
08-Aug	4:55	6.9							7.5							
08-Aug	9:56	9.5									14.5					
08-Aug	16:21	14.6		16	16	16		16	16		16		16			81
08-Aug	19:23	8.8		13.3	10.9	9.6		10.5	10.5		10.8		14.3			
08-Aug	22:02	6.9		8	10.2	10.5		10.4	13.3		12.8		14.9		20.4	
09-Aug	6:48	15.7		17.8	12.5	19.2		12.5	20.7		33.4					
09-Aug	11:42	24		25	25	23.6		22.4	52.2		54					
09-Aug	15:35	30.1		32	35	33		34	30		31		32		59	
09-Aug	16:51	21.1		20.4	21.5	21.4		23.9	22.5		27.2		28		32	
09-Aug	20:13	16.7		18	18.6	31.3		38.9	40		42		44		46	
09-Aug	22:00	19.9		17.1	17.1	18.4		17.4	18.7		20		20			
10-Aug	4:51	21.1													32	
10-Aug	10:00	19.9											20			
10-Aug	14:58	7.9		8.1	7.1	8.9		11	11.9							

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	2.0	3.0	3.5	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0
10-Aug	17:59	7.7		8.1	7.3	8.3		9.1	8.6		8.9		13.4			
10-Aug	20:26	6.8		7.3	6.9	7.7		8.5	8.5		20.2		37.7		41.8	
11-Aug	5:00	7.4		7.2	7.7	7.1		13.9	15.3		37.3					
11-Aug	10:17	8.3		7.9	7.9	8.2		9.2	31.4		20.3		34			
11-Aug	14:35	35		25	25	25		28	90		100		110			
12-Aug	9:36	20.1		20	21.9	20		20.2	21.3		28.3					
12-Aug	12:25	22.5		23.5	19.5	20.5		25.5	21.5		21.5		28.5			
12-Aug	23:14	13.95		15	25	22		23	22		21		20			
13-Aug	7:00	35		32	33	34		33	30		33		33			
13-Aug	12:45	24		22	23	26		26	26		26		29		30	34
13-Aug	19:05	20.5		20.5	16	16		15.5	16.2		26.5		38			
13-Aug	22:33	14.2		13.9	15	14.7		15	15.5		27		49			
14-Aug	9:35	19		17	21	26		41	31		40		40			
14-Aug	16:21	49		51	53	50		50	49		85		92			
14-Aug	21:20	54		57	58	50		60	56		68		72			
16-Aug	5:35	34		32	32	29		33	33		31		31			
16-Aug	19:41	32		34	35	33		34	33		33		28		28	
17-Aug	5:40	38		33	36	36		37	34		32		31		35	
17-Aug	16:34	40		40	40	39		42	45		46		40			
17-Aug	19:53	43		43	39	41		40	40		40					
18-Aug	5:45	30		31	33	33		32	33		32		33			
18-Aug	20:04	36		38	38	39		38	41		39	40				

APPENDIX I
TURBIDITY MEASUREMENTS AT SECOND PORTAGE LAKE
(JULY 31, 2008 to SEPTEMBER 30, 2008)

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	2.0	3.0	3.5	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0
19-Aug	15:30	41		38	43	40		42	45		55		53			
20-Aug	10:32	33		31	35	30		35	33		34		35			
20-Aug	14:49	42		43	41	41		41	40		43					
20-Aug	19:51	40		40	40	42		47	51		50		50			
21-Aug	11:20	39		38	40	41		34	32		35		32			
21-Aug	17:08	33		39	40	39		39	38		38		39			
22-Aug	17:16	26		23	26	26		26	27		26		28			
23-Aug	12:06	26		25	26	27		32	30		30		25			
24-Aug	11:20	31		34	33	32		32	32		31					
24-Aug	17:20	29		34	34	37		29	36							
25-Aug	9:51	32		29	30	30		29	31		28					
25-Aug	16:50	28		30.1	26.9	27.5		29.4	26.6		27.3					
28-Aug	10:02	20.5		20.5	20	20.5										
29-Aug	10:59	18.4		18.4	20.1	21.4		18.8	19.7		20.3		19.1			
30-Aug	15:31	23.7		22.3	25.7	22.7										
31-Aug	10:17	30		26.1	25.8	24.3		25								
01-Sep	10:40	17.8		17.8	16.8	16.9		18.3	21		17.7		21.4		19	
02-Sep	10:11	17.8		16.1	15.6	18.7		19.2	17.7		17.5		18			
03-Sep	10:34	15.3		17.6	20.3	18.8		18.2	18.4		18.6		16.4			
04-Sep	13:57	15.6		14.2	14	16.7		14.7	17							
05-Sep	9:21	13.3		13.4	14.6	15.8		16	15.9		16.2		15.1			
06-Sep	14:57	13.5		13.4	12.7	12.3		12.5	12.8		12.9		13.1		12.6	12.5

Date	Time (24 hr)	Depth (m)														
		0.0	0.5	1.0	2.0	3.0	3.5	4.0	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0
07-Sep	9:41	15.1		16.9	16	16.7		16.9	15.9		16.6		17.5			
08-Sep	16:22	14		14	14	14		14	14		14		14			
09-Sep	11:16	15.7		14.1	15.1	16.3		15	14.9		15.7					
10-Sep	10:11	14		15	15	14		15	14		15		14			
12-Sep	9:50	13		14	14	14		14	14		14		14			
13-Sep	9:53	12		12	14	13		13	13							
14-Sep	8:42	11		11	11.4	10.8		11	11.2		11.4		11.5			
17-Sep	9:59	12		12	13	13		14	14		13		14			
18-Sep	10:47	10		10	10	10		11	11		11					
19-Sep	8:26	10		11	11	11		11								
21-Sep	9:12	8.9		8.8	8.8	8.8		8.9	9.3							
23-Sep	10:15	9.5		9.8	10.7	9.5		9.8	9.5		10.4		10.8		10.3	
25-Sep	8:55	8.6		9.8	10.1	9.3		10.2	9.4		9.8		10.7			
27-Sep	10:20	16.8		19.1	16.6	19.4		16.9	21.1		18.2		18.8			
28-Sep	8:45	17.8		18.3	19.8	16.8		20.1	17.8		17.1		17.2		19	
29-Sep	8:50	25.6		24.4	22.3	22.4		23.1	22.3		22.1		22.7		24.7	
30-Sep	9:59	31.9		31.8	31.4	31.9		32.3	31		27.7		28.2			

Table I.5: Turbidity Measurements at Station NE1

Date	Time (24 hr)	Depth (m)															
		0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
01-Aug	3:45	0.52															
01-Aug	9:05	0.6		0.6	0.8	0.7	0.7	0.8	0.7		0.7		0.7		0.8		0.8
02-Aug	0:20	0.8														8	
02-Aug	3:40	0.8											8.9				
02-Aug	5:47	1.06													8.6		
02-Aug	8:41	1.4		1.6	1.5	1.5	1.5	1.5	2.5		2.5		3.5		6.5		6.8
02-Aug	14:25	2.5		2.7	2.7	2.7	2.7	2.7	3		3.3		3.3		6		9
02-Aug	21:43	2.8													9.3		
03-Aug	2:58	2.4								7.9							
03-Aug	5:26	2.2													8		
03-Aug	9:15	2.5		2.5	2.5	2.5	2.5	2.5	6.6		9.4		7.5		7.6		6.6
03-Aug	14:03	2.7		2.7	2.7	2.7	2.9	2.6	2.3		2.4		6.7		8.7		7.3
03-Aug	21:37	2.3													6.4		
04-Aug	1:01	2.4												5			
04-Aug	5:06	2.3													5.9		
04-Aug	14:53	2.5		2.4	2.7	2.8	2.6	2.8	2.6		2.8		2.7		2.9		3.5
05-Aug	1:48	2.5										3.8					
05-Aug	5:49	2.3													4.5		
05-Aug	14:36	3		2.6	2.8	2.8	2.6	2.8	8.1		6.5		12.5		18.7		
05-Aug	21:54	3.2													11		
06-Aug	1:44	3.2													9.9		

Date	Time (24 hr)	Depth (m)															
		0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
06-Aug	5:27	3.2	4.9														
06-Aug	13:36	4.5		4.5	5	5.2	5.3	5.3	5.6		6.2		6		7.6		10.7
07-Aug	4:58	5.8															
07-Aug	8:46	6.1		6.9	7.7	6.9	6	6.3	7.9		8.8		9.9		10.2		13.7
07-Aug	14:30	5		5.5	5.7	5.8	6.2	6.1	7.8		8.9		14.5		22.5		26.3
07-Aug	21:33	4.8													24		
08-Aug	5:35	8.4														72	
08-Aug	11:12	6.2															57
08-Aug	13:40	9.2															59
08-Aug	16:44	6.7		6.7	7.2	9.3	17.1	16.5	28		29		29		39		
08-Aug	19:44	5.9		7.1	6.7	13.1	15.4	16.9									
08-Aug	22:27	5.7		5.8	7.2	13.1	12.9	15.9									
09-Aug	4:53	6.5		6.6	6.6	5.5	8.6	9.8	16.9		17.1		38.8		58.8		75.1
09-Aug	9:09	6.7		7.5	7.2	6.9	7.3	6.9	7.5		8.5		14.5		36.2		71.9
09-Aug	16:51	7.3		5.6	9.4	11.3	10.8	8	7		7						
09-Aug	20:41	10.3		11.3	9.9	9.3	9.6	7.5	6.5		6.1		6		6		
10-Aug	5:20	9.11		9.2	9.5	8.4	8.7	8.6	7.6		8.3		7.5		9.9		50
10-Aug	8:28	8.1		8.2	7.8	7.9	9.5	11.5	9.1		12.5		11.7		18.1		47.5
10-Aug	14:25	8.2		8.3	7.4	7.7	7.9	8.1	8.2		8.4		19.7		43.2		60.1
10-Aug	16:07	7.4		7.5	7.9	7.9	7.8	8.7	9.2	18.9	32	42	54		58		
10-Aug	20:52	5.9		4.7	5.3	6.2	8.8	16.1	25		24.6		37.6		45		
11-Aug	5:48	6.3		5.7	6	6.6	7.6	8.3	11.6		34.8		68		63.1		63.5

Date	Time (24 hr)	Depth (m)															
		0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
11-Aug	9:00	6.7		17.8	15.3	12.4	7.1	7.6	7.6		9.3		54.5		52.7		
11-Aug	16:53	6.5		6.6	9	6.6	7	6.5	6.5		7.1		5.5		11		39
12-Aug	11:10	9		8	8	8	9	9	10		10		10		10		10
12-Aug	14:10	11		12	10	10	11	11	11		12		12		10		11
13-Aug	7:55	37		37	37	39	40	40	35		39		38		61		84
13-Aug	11:00	37		41	39	37	34	33	38		44		56		91		107
13-Aug	15:37	31.5		27.1	35.5	24.8	32.5	32.5	50.5		72.5		99		130		170
13-Aug	21:53	30.6		27.1	22	23.4	33.1	41.4	43.8		51.6		72.5		43.8		293
14-Aug	5:45	23		25	25	24	25	40	45		70		86		158		548
14-Aug	19:58	62		65	62	63	66	70	80		85		87		89		100
15-Aug	21:53	91.5		95	96	96	98	101	96		104		104		111		104
16-Aug	9:15	148		153	150	150	154	145	133		235		244		248		325
16-Aug	20:37	46		42	43	37	109	133	168		130		170		210		324
17-Aug	9:44	82		64	64	64	77	67	67		155		200		243		275
17-Aug	17:15	70		65	70	73	75	151	160		165		275		287		510
18-Aug	8:23	82		79	97	104	101	107	121		150		186		187		462
18-Aug	16:08	59		79	83	85	83	83	89		116		130		160		579
18-Aug	20:50	51		50	52	50	56	80	89		116		133		344		635
19-Aug	13:45	77		82	77	79	83	85	86		103		105		106		198
20-Aug	8:39	61		60	64	69	65	79	82		68		71		78		91
20-Aug	15:28	76		77	83	84	95	95	101		102		130		157		197
20-Aug	20:25	69		73	71	68	76	86	122		161		183		219		240

Date	Time (24 hr)	Depth (m)															
		0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
21-Aug	9:08	86		99	102	106	119	109	123		130		190		248		295
21-Aug	16:12	49		57	57	67	82	95	100		100		136		137		260
22-Aug	11:47	85		93	90	90	91	128	147		123		140		198		362
23-Aug	10:45	68		79	83	90	84	80	84		86		107		208		290
24-Aug	9:26	81		91	90	90	91	82	88		89		89		90		160
25-Aug	8:04	100		79	79	97	100	99	97		101		117		116		190
25-Aug	16:07	84.4		73.7	77.4	77.7	87.6	83.4	92.8		100.7		100.9		133.4		
28-Aug	9:16	81.7		69.8							90.1						
29-Aug	9:28	57.9		66.9	55	56.2	52.3	60.1	56		55		56.9		55.5		51.9
30-Aug	16:33	61.7		67.4	73.4	59.2	69.8	69.4	76.6		79.4		69.7				
31-Aug	8:52	59.5		70.3	66.5	55.6	55.1	58.7	57.3		56.2		60.3		63.1		75.3
01-Sep	8:23	60.4		60.9	58.3	72.9	57.7	61.5	59.2		59.5		66.9		67.1		65.2
02-Sep	8:28	64.7		63.6	61.9	59.6	64.4	67	61.4		63.9		61.9		65.2		66.1
03-Sep	9:03	45		52.8	45.1	48.5	51.9	59.8	59.8		64.8		56.9		54.5		56.8
04-Sep	9:15	54.7		51.5	53.5	43.7	49.7	48.2	47.7		46.9		51.3		45.6		
04-Sep	16:09	52.2		42.3	51.7	54.4	46.7	47.6	55.5		48.1		55.3		49.5		48
05-Sep	8:31	39.6		48.7	49.7	48.6	49.1	46.6	50.1		51.7		52.4		51.7		51.2
06-Sep	8:35	32.9		32.8	31.8	36.8	39.5	34	33.6		36.1		35.5		41.9		
07-Sep	8:43	35.8		35	37.1	40	40.9	39.1	39.9		41.4		39.5		38.7		
08-Sep	15:13	31		31	33	34	36	37	38		40		38		38		37
09-Sep	8:57	30		29	27	29	27	29	28		29		28		28		27
10-Sep	8:16	31		27	29	30	31	30	30		31		30		29		30

Date	Time (24 hr)	Depth (m)															
		0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
12-Sep	8:26	27		23	24	24	25	24	25		23		25		25		26
13-Sep	8:07	24		24	21	22	22	23	22		24		23		23		24
14-Sep	9:21	22		21	23	23	22	24	24		24		24		24		25
15-Sep	10:41	20		20	21	20	22	21	21		20		21		23		20
16-Sep	8:07	19		20	20	19	19	18	18		18		19				
17-Sep	8:29	17		18	17	18	19	17	19		19		17		19		
18-Sep	9:05	17		17	17	18	18	18	19		18		18		18		
19-Sep	9:02	16.1		17.3	16.8	16.5	16.1	16.5	17		15.8		16.7		17.1		16.5
21-Sep	8:13	14.1		14.1	13.8	14	14.3	14.1									
23-Sep	9:00	13.9		15.4	14.8	13.3	15.5	14.8	15.4		16.8		15.7		15.1		17.3
25-Sep	9:49	18		16.7	13.9	15.7	16.2	16.2	15.8		16.6		16.7		14.4		14.8
30-Sep	8:22	11.9		11.9	13.9	12.2	11.8	11.7	12.3		12.2		12.9		12.9		13.3

Table I.6: Turbidity Measurements at Station NE2

Date	Time (24 hr)	Depth (m)													
		0.0	1.0	1.5	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0
01-Aug	3:47	1.19													
01-Aug	9:15	1.7	1.6		1.7	1.7		1.6							
02-Aug	0:22	1.9						4.8							
02-Aug	3:45	1.1								1.5					
02-Aug	5:50	1.9				2.1									
02-Aug	8:50	3	3.4		3.4	3.5		3.8		5					
02-Aug	14:38	2.7	2.7		2.7	3.5		3.5		3.5					
02-Aug	21:47	2.4			2.9										
03-Aug	3:02	2.2						2.4							
03-Aug	5:30	2.2								2.5					
03-Aug	9:25	2.5	2.3		2.3	2.3		2.3							
03-Aug	14:13	2.1	2.1		2.3	2.3									
03-Aug	21:40	2.2			2.5										
04-Aug	1:04	3					2.8								
04-Aug	5:09	2.3								4.3					
04-Aug	15:06	3.5	2.7		2.7	2.6		2.8		3.5					
05-Aug	1:43	2.1										2.5			
05-Aug	5:52	2.5										3.5			
05-Aug	14:49	2.8	2.7		2.9	2.8		2.8							
05-Aug	21:56	2.8				3.6									
06-Aug	1:51	2.8							3.5						

Date	Time (24 hr)	Depth (m)													
		0.0	1.0	1.5	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0
06-Aug	5:29	2.7						3.8							
06-Aug	13:45	4.5	4.7		4.7	4.2		4.2							
07-Aug	5:00	5.1		5.7											
07-Aug	8:55	5.5	5.4		5.5	5.5		5.7							
07-Aug	14:38	5.5	5.1		5.2	5.1		5.4							
07-Aug	21:36	4.5							5.3						
08-Aug	5:47	5.1					5.3								
08-Aug	11:10	6.7						8.8							
08-Aug	13:42	7.7								8.8					
08-Aug	16:51	5.4	5.5		5.5	4.3		9.1							
08-Aug	20:00	6.8	6.6		8.3	5.7		8.2							
08-Aug	22:40	5.8	6.2		4	2.8									
09-Aug	5:02	6.3	6.5		6	6.3		5.8		7.9					
09-Aug	9:16	6.2	6.2		6.8	6.5		6.8							
09-Aug	16:57	8.8	9.5		8.9	7.8		8.2		8.8		7		16	10
09-Aug	20:46	10.6	10.4		10.6	10.6		9.7		8.8					
10-Aug	5:26	10.8	11.5		11.3	9.2		10.6		11.5					
10-Aug	8:37	16.4	17.8		18.4	16.5		16		19.4					
10-Aug	14:20	5.1	6		8.7	9.9		11.2		11.4					
10-Aug	16:16	4.1	5.4		5.3	5.3		6.5		5.8	5.3				
10-Aug	20:58	7.8	7.7		6.8	5.6		5.3							
11-Aug	5:58	6.9	6.5		7.1	7		7.1		9.5					

Date	Time (24 hr)	Depth (m)													
		0.0	1.0	1.5	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0
11-Aug	9:10	6.1	6.5		7.3	6.8		6.9							
11-Aug	15:30	7	10		9	10		9		11					
12-Aug	11:00	18	9		9	10		18		18					
12-Aug	14:17	10	11		12	12		12		12					
13-Aug	8:00	27	32		31	31		29		30					
13-Aug	11:08	25	27		28	30		32		59		123			
13-Aug	16:38	28.5	26.2		28.6	20		24		64.2					
13-Aug	22:01	30	26		14.9	17		25.9		28					
14-Aug	6:22	22	23		22	21		19		15					
14-Aug	20:08	39	40		35	34		35		36					
15-Aug	22:00	89	92		95	88		96		101					
16-Aug	9:40	138	131		133	147									
16-Aug	20:45	39.8	40		39	44		58		1400					
17-Aug	9:36	46	50		35	44		44		45		54			
17-Aug	17:22	61	60		62	64		59		69		96			
18-Aug	9:01	84	91		83	87		89							
18-Aug	16:14	59	42		50	54		77		103					
18-Aug	21:02	50	53		50	52		58		56	59				
19-Aug	14:17	84	85		76	81		82							
20-Aug	9:08	70	81		79	81		63		67		68			
20-Aug	15:37	74	72		72	84		98		120					
20-Aug	20:35	75	75		77	75		76		76					

Date	Time (24 hr)	Depth (m)													
		0.0	1.0	1.5	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0
21-Aug	9:36	101	89		98	97		95							
21-Aug	16:20	47	53		49	49		49							
22-Aug	11:59	96	95		100	96		98							
23-Aug	10:51	73	70		82	84		79		90					
24-Aug	9:50	80	78		79	80		80		78		87			
25-Aug	8:13	101	100		99	99		99		102					
25-Aug	15:55	66.1	61.1		68.1	76.2		72.5		73.6		90.1	85.1		
29-Aug	9:38	63.4	66.1		56	70		56.3							
30-Aug	16:25	56.3	57.3		57.1	64.4									
31-Aug	8:48	69.8	61.6		75.2	78.6		70.2		78.1					
01-Sep	8:19	61.3	58.8		55.2	57.8		56.2							
02-Sep	8:24	57.2	58.6		59.2	64.6		64.6							
03-Sep	9:00	46.7	48.2		54.2	52.2		55.2		54.6		55			
04-Sep	9:12	48.5	57.8		61.3	54.2		53		52.3					
04-Sep	16:06	48.2	41.7		51.8	42.5		54.1							
05-Sep	8:28	37.2	47.9		46.4	43.9		45.7							
06-Sep	8:31	34	39.3		39.1	37.4		38.2		34.3					
07-Sep	8:39	41.7	38.1		39.7	39.5		42							
08-Sep	15:20	30	32		32	32		30							
09-Sep	9:07	27	29		30	30		30							
10-Sep	8:25	27	26		27	29		29							
12-Sep	8:35	26	24		25	24		24		24					

APPENDIX I
TURBIDITY MEASUREMENTS AT SECOND PORTAGE LAKE
(JULY 31, 2008 to SEPTEMBER 30, 2008)

Date	Time (24 hr)	Depth (m)													
		0.0	1.0	1.5	2.0	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0
13-Sep	8:18	22	22		22	22		22							
14-Sep	9:33	24	24		23	23		24		23					
15-Sep	10:48	20	19		20	20									
16-Sep	8:15	18	19		19	18		19		19					
17-Sep	8:36	17	17		17	18		17							
18-Sep	9:17	19	18		18	17		17							
19-Sep	9:09	16.8	16.7		16.9	16		18.1		18.1					
21-Sep	8:17	15.6	13.6		13.2	13.5		13.1		14.9					
23-Sep	9:03	18.1	15.2		14.5	15.1		14.8		18.5		17.3			
25-Sep	9:53	14.8	14.9		14.8	15.3		14.9							
30-Sep	8:26	11.2	12.4		12.7	11.9		12		11.9					

Table I.7: Turbidity Measurements at Station NE3

Date	Time (24 hr)	Depth (m)																	
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	9.0	9.5
01-Aug	4:02	0.77																	
01-Aug	9:26	1.5		1.7		1.6		2.1		2.3		2.2		4.1					
02-Aug	0:25	4							4.8										
02-Aug	3:48	2							4.7										
02-Aug	5:53	2.2						2.9											
02-Aug	8:58	3.2		3.7		3.7		3.7		3.7		3.5							
02-Aug	14:47	2.5		3		3		3.5		3.5		3.5		5					
02-Aug	21:50	2.6				2.9													
03-Aug	3:05	2.7	2.7																
03-Aug	5:33	1.8											2.5						
03-Aug	9:38	2.5		2.2		2.2		3.9		4.3		4.3							
03-Aug	14:21	2.7		2.7		3.7		3		3		3.3		3.7					
03-Aug	21:42	4					4.5												
04-Aug	1:07	4.2								4.2									
04-Aug	5:12	3.2	3.5																
04-Aug	15:13	2.4		2.3		2.5		2.1		2.3									
05-Aug	1:39	2.3				2.6													
05-Aug	5:53	2.3			3														
05-Aug	15:00	2.8		2.8		2.9		2.8		2.9		2.8							
05-Aug	21:58	3.8						4											
06-Aug	1:53	2.7							3.2										

Date	Time (24 hr)	Depth (m)																	
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	9.0	9.5
06-Aug	5:31	2.5						3.1											
06-Aug	13:50	4.4		4.5		4.6		4.6		4.7		4.3							
07-Aug	5:02	4.5													4.9				
07-Aug	9:00	4.4		4.5		4.7		4.2		4.4									
07-Aug	14:42	4.9		4.7		4.8		5.2		5.3									
07-Aug	21:47	4.5		5.5															
08-Aug	5:49	5.3											6.8						
08-Aug	11:07	6.9										5.7							
08-Aug	13:50	7.3												16.4					
08-Aug	16:53	5.6		5.7		6		7		8.3		14.8		14.2					
08-Aug	20:05	6.1		7.8		8.3		4.9		5.9		8							
08-Aug	22:42	6.6		7.4		7.5		4.4		13		20		32					
09-Aug	5:06	6.4		5.9		5.7		4.7		11.9		12.5							
09-Aug	9:53	10.4		9.6		10		9.5		9.5		9.3							
09-Aug	17:02	7.8		7.8		8.6		8.7		9		12.5		12.5					
09-Aug	20:48	13.4		13.9		13.3		11.7		10.7		10.5		9.1		9.1	11	10.6	10.5
10-Aug	5:30	16.5		18.4		20.7		20.1		20.1		21.1							
10-Aug	8:43	11.9		14.6		14.3		11.4		11.9		10.7							
10-Aug	14:17	3.9		4.3		5.1		4.4		4.4		4.8							
10-Aug	16:39	3.5		5.2		6.6		9.2		7.5		8.4							
10-Aug	21:16	6.3		6.6		6.9		5.6		5.4	5.8	36	35.6	46					
11-Aug	6:03	5.7		6.1		6.5		7.6		6.5		9.6		14.5					

Date	Time (24 hr)	Depth (m)																	
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	9.0	9.5
11-Aug	9:14	14.3		15.5		12.7		11.1		10		16.5		21.5		24.4			
11-Aug	15:42	12		14		12		11		12		14		12					
12-Aug	10:50	11		13		12		12		12		11							
12-Aug	14:20	11		12		12		12		12									
13-Aug	8:05	18		19		19		21		20									
13-Aug	11:17	25		26		26		26		27									
13-Aug	16:43	9.7		11.7		14.4		14.3		13.5		26.2							
13-Aug	22:06	23.8		23		17.5		19.1		30.6		60							
14-Aug	6:28	19		20		22		22		25		31							
14-Aug	20:17	44		46		50		53		51		50		47					
15-Aug	22:04	79		76		85		80		88									
16-Aug	9:45	40		47		54		97		120		132		118					
16-Aug	20:58	47		50		58		90		105		125							
17-Aug	9:28	38		35		30		32		32									
17-Aug	17:28	48		40		56		48		67									
18-Aug	9:05	74		83		91		82		102		143		152					
18-Aug	16:19	60		72		87		91		99									
18-Aug	21:10	46		45		45		47		48									
19-Aug	14:22	87		79		79		91		93		103		117					
20-Aug	9:14	53		68		62		69		61									
20-Aug	15:44	65		64		66		65		68									
20-Aug	20:40	63		73		59		68		85		79							

Date	Time (24 hr)	Depth (m)																	
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	9.0	9.5
21-Aug	9:56	63		67		52		62		66		72							
21-Aug	16:25	55		51		51		50		61		55							
22-Aug	12:04	87		84		84		84		85		91		118					
23-Aug	10:55	70		68		70		60		67		76							
24-Aug	10:00	63		68		73		77		71									
25-Aug	8:19	80		71		93		73		88									
25-Aug	15:47	62.4		64.5		59.4		58.2		63.2		76.6		134.4					
29-Aug	9:20	68.7		69.5		61.9		62.5		72.5		78.8		114					
30-Aug	16:22	54.2		53.8		58.9		65.7		61.5		54.4		60.2					
31-Aug	8:42	59.1		53.3		53.8		55.2		74.9		83.6							
01-Sep	8:14	56.3		62.4		64		63.4		70.4		70.7		85.3					
02-Sep	8:21	52.6		53.4		56.1		59.1		61.3		55.7							
03-Sep	8:55	48.1		46.6		49.2		49.2		52.3									
04-Sep	9:09	45.5		53.4		44.3		50.2		47.9									
04-Sep	16:04	39.9		40		38.9		37.3		45.9									
05-Sep	8:24	45		46.4		44.6		45.4		48.8		46.6							
06-Sep	8:28	34.9		33.7		34.2		33.3		39.3									
07-Sep	8:36	33.5		32.7		36.4		34		36.1									
08-Sep	15:25	31		32		35		30		31		32							
09-Sep	9:23	29		26		27		27		27		28							
10-Sep	8:32	26		24		24		27		26		29		28		26			
12-Sep	8:43	24		25		25		25		24									

Date	Time (24 hr)	Depth (m)																	
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0	9.0	9.5
13-Sep	8:27	20		23		21		21		21									
14-Sep	9:40	23		24		23		22		23		22							
15-Sep	10:52	19		19		20		20		19		20		19					
16-Sep	8:20	18		18		20		19		19									
17-Sep	8:43	17		19		18		18		18									
18-Sep	9:25	17		17		17		18		16									
19-Sep	9:13	16.1		16.1		16.8		16.1		16.1		15.6							
20-Sep	8:20	15.7		16.3		16.6		16.1		15.8									
21-Sep	8:21	14.7		14.1		14.8		14.1		14.1		15.8							
23-Sep	9:07	15.4		15.8		15.4		15.9		16.2		16							
25-Sep	9:56	16.4		15.7		14.2		15		14.8									
29-Sep	14:38	12		11.9		12.6		12.5		11.8		14.1		12.5		12.8			
30-Sep	8:28	11.3		11.4		11.4		11.3		11.4		12.8		12.2					

Table I.8: Turbidity Measurements at Station SE1

Date	Time (24 hr)	Depth (m)				
		0.0	0.5	1.0	1.5	2.0
01-Aug	4:13	0.94				
01-Aug	9:40	8.6		8.8		
02-Aug	0:40	4.8		5.2		
02-Aug	4:06	3.8	4.3			
02-Aug	6:09	3.4		3.4		
02-Aug	9:11	3.3			3.3	
02-Aug	15:15	9.5		10.4		
02-Aug	22:03	9	9.3			
03-Aug	3:17	2.4		2.8		
03-Aug	5:44	2.5		2.9		
03-Aug	10:22	5.3		6.1		
03-Aug	14:40	5.2		5.2		
03-Aug	21:52	7.1			7	
04-Aug	1:25	6.8	8.5			
04-Aug	5:23	5				
04-Aug	15:23	9.4		9.5		
05-Aug	1:19	2.6	3			
05-Aug	6:01	3.1				
05-Aug	15:40	2.8		2.7		
05-Aug	22:10	3.2		3.4		
06-Aug	2:04	2.9		3.1		

Date	Time (24 hr)	Depth (m)				
		0.0	0.5	1.0	1.5	2.0
06-Aug	5:42	2.9				
06-Aug	14:10	9.3		8.3		
07-Aug	5:11	4		4.4		
07-Aug	9:18	4.3		4.4		
07-Aug	15:02	4.1		4.1		
07-Aug	21:58	6.1	6.5			
08-Aug	6:07	4.8			5.8	
08-Aug	10:56	4.9		6.1		
08-Aug	14:04	5.5		6.8		
08-Aug	17:41	6		5.9		6.4
08-Aug	20:18	6.3		7.7		
08-Aug	22:57	5.8		6.8		
09-Aug	5:23	8		8		
09-Aug	10:09	11.4		11.4		
09-Aug	17:19	22.4				
09-Aug	17:48	33.5		39.2		
09-Aug	21:01	28.2		30.3		
10-Aug	5:48	33.5		39.2		
10-Aug	9:03	36.7				
10-Aug	14:11	18.9		19.4		
10-Aug	16:54	8		8.9		
10-Aug	21:31	7.6		8.6		

Date	Time (24 hr)	Depth (m)				
		0.0	0.5	1.0	1.5	2.0
11-Aug	6:21	22.2		22.7		
11-Aug	9:21	24.7		24.5		
11-Aug	15:50	15		16		
12-Aug	10:15	18		20		
12-Aug	14:25	13		14		
13-Aug	8:10	18		19		
13-Aug	11:23	21		21		
13-Aug	17:00	13.7		16.4		
13-Aug	21:30	12.9		13		
14-Aug	6:37	14		15		
14-Aug	20:24	60		62		
15-Aug	22:21	76		74		
16-Aug	10:18	36		37		
16-Aug	21:04	41		42		
17-Aug	9:23	29		32		
17-Aug	17:39	48		49		
18-Aug	9:12	49		50		
18-Aug	16:35	50		39		
18-Aug	21:16	53		53		
19-Aug	14:30	137		151		
20-Aug	8:27	61		70		
20-Aug	15:59	62		64		

Date	Time (24 hr)	Depth (m)				
		0.0	0.5	1.0	1.5	2.0
20-Aug	20:51	63		62		
21-Aug	10:04	54		62		
21-Aug	16:08	52		56		
22-Aug	12:13	61		65		
23-Aug	11:00	66		74		
24-Aug	10:07	63		69		
25-Aug	8:30	67		64		
25-Aug	15:28	59.5		50.5		
27-Aug	9:15	61.5		66.5		
28-Aug	9:29	55.5				
29-Aug	8:43	43.2				
30-Aug	16:11	59.9				
31-Aug	8:31	63.6		66.8		
01-Sep	8:09	58.6		58.3		
02-Sep	8:07	42.3		48.9		
03-Sep	8:49	54.4		52.5		
04-Sep	9:01	46.8		49.3		
04-Sep	15:56	38.3		41.5		
05-Sep	8:20	55.9		53.8		
06-Sep	8:22	37		33.4		
07-Sep	8:29	49.3		51.2		
08-Sep	15:34	39		44		

Date	Time (24 hr)	Depth (m)				
		0.0	0.5	1.0	1.5	2.0
09-Sep	9:33	34		34		
10-Sep	8:43	27		27		
12-Sep	8:53	22		23		
13-Sep	8:39	21		22		
14-Sep	9:55	22		19		
15-Sep	11:02	20		19		
16-Sep	8:31	19		18		
17-Sep	8:53	16		17		
18-Sep	9:36	18		18		
19-Sep	9:19	16.9		15.5		
20-Sep	8:16	15.7		16.4		
21-Sep	8:27	13.8		13.1		
23-Sep	9:17	14.7		14.8		13.5
25-Sep	10:07	13.4		16.9		
30-Sep	8:34	11.8		11.4		

Table I.9: Turbidity Measurements at Station SE2

Date	Time (24 hr)	Depth (m)												
		0.0	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**6.0**	**7.0**
01-Aug	4:17	4.98												
01-Aug	9:50	7.5		7.5		8.5		8.5						
02-Aug	0:50	6.2		7.2										
02-Aug	4:11	7.2						6.8						
02-Aug	6:12	8.1	8.8											
02-Aug	9:18	12.9		13.5		13.8		14.5						
02-Aug	15:23	10.4		12.6		12.6		12.6						
02-Aug	22:05	8.4							10.9					
03-Aug	3:19	7.3							9.2					
03-Aug	5:46	7.1	7.6											
03-Aug	10:29	6.6		6.6		7.4		7.6						
03-Aug	14:45	6.9		7.4		7.4		7.6						
03-Aug	21:54	4.5						5.5						
04-Aug	1:28	5.7						6						
04-Aug	5:25	5.9		7.2										
04-Aug	15:34	12.5		12.5		12.5		13.1						
05-Aug	1:22	7.7							10.3					
05-Aug	6:03	8							9.3					
05-Aug	15:49	10		10		10		9.9		13.5				
05-Aug	22:14	11								12				
06-Aug	2:06	10.4								12.6				

Date	Time (24 hr)	Depth (m)												
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0
06-Aug	5:44	11.5								14				
06-Aug	14:18	25.5		26.5		26.9		28.6		29.8				
07-Aug	5:14	61												
07-Aug	9:22	73.5		71		68.5		71.8		90.8				
07-Aug	15:20	60.5		65.7		65.4		101.7		107.5				
07-Aug	22:01	20							60					
08-Aug	6:10	32			34.8									
08-Aug	10:50	7.9						41.7						
08-Aug	14:07	8.1								38				
08-Aug	17:05	6.4		5.8		22		28		27.5		34	38	
08-Aug	20:21	7.7		7.3		12.3		29.3		34.7	28			
08-Aug	22:59	7.7		6.8		6.5	9	29.8	32	34				
09-Aug	5:28	13.2		13		13		13						
09-Aug	10:14	13		13.5		14.9		13						
09-Aug	17:22	26		26.1		26		28		28				
09-Aug	17:52	37.4		38		39.1		40.1						
09-Aug	21:04	31		28.4		30.8		29.2		30.7				
10-Aug	5:52	37.4		38		39		40.1						
10-Aug	9:09	36.7						39.5						
10-Aug	14:04	35		35		37.5		33.5						
10-Aug	16:57	30.3		28.6		29.9	37.7	32.3	42	65.2				
10-Aug	21:34	26.7		26.5		22.6		30.6	42	42				

Date	Time (24 hr)	Depth (m)												
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0
11-Aug	6:25	25.3		27.5		23.6		25.7						
11-Aug	9:25	11		25.4		26.9		25.5						
11-Aug	15:58	19		22		23		23		22				
12-Aug	10:10	35		38		38		41		46				
12-Aug	14:28	84		85		84		104		102				
13-Aug	8:15	43		48		53		61		60		78		
13-Aug	11:35	48		46		47		51		111		140	248	
13-Aug	17:13	16.5		17.8		18.6		163		122.2				
13-Aug	21:24	17		18.1		15.5		140		150				
14-Aug	6:50	23		24		24		31		27		92		
14-Aug	20:29	122		135		147		145		152		160	155	1300
15-Aug	22:27	114		114		112		110		114		115		
16-Aug	10:40	134		136		106		122		132		135		
16-Aug	21:17	50		78		98		103						
17-Aug	9:12	48		43		53				91				
17-Aug	17:41	126		139		130		145						
18-Aug	9:30	72		78		88		126						
18-Aug	16:29	64		49		81		104						
18-Aug	21:20	73		70		76		85	79					
19-Aug	14:35	141		156		152		163						
20-Aug	9:20	244		206		239		202						
20-Aug	16:16	201		230		219		152						

APPENDIX I
TURBIDITY MEASUREMENTS AT SECOND PORTAGE LAKE
(JULY 31, 2008 to SEPTEMBER 30, 2008)

Date	Time (24 hr)	Depth (m)												
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0
20-Aug	20:54	91		99		138		160		160				
21-Aug	10:07	149		147		168		157		210		247		
21-Aug	16:31	159		142		153		160		154				
22-Aug	12:16	72		74		89		113		118				
23-Aug	11:03	60		64		68		63		61				
24-Aug	10:16	90		137		123		124		144				
25-Aug	8:33	89		89		85		88		75				
25-Aug	15:21	60.5		64.5		68.2		61.3		74.5				
27-Aug	8:45	66.2		53.3		52.1		70.3		67				
28-Aug	9:43	43.9								57				
29-Aug	8:34	41.5		48.1		48.2		39.4						
30-Aug	16:08	60.8		63.2		62.9								
31-Aug	8:24	76.2		72.7		72		62.8		76.8				
01-Sep	8:06	57		59.7		58.7		68.1						
02-Sep	8:02	55.7		57		50.4		55.7		54.4				
03-Sep	8:44	45.5		49.7		43.4		50.3		48.2				
04-Sep	8:56	51.2		47.1		44.5		46.6		49.6				
04-Sep	15:53	37.8		40.1		44.8		44		40.7				
05-Sep	8:12	37.4		43.1		44.2		42.5		48.7				
06-Sep	8:18	38.7		39.9		44.6		42.3						
07-Sep	8:26	42.6		40.1		39.7		42.6						
08-Sep	15:38	32		34		31		31		33				

Date	Time (24 hr)	Depth (m)												
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0
09-Sep	9:36	33		31		30		30		30				
10-Sep	8:47	32		30		30		31		32				
12-Sep	8:56	27		26		26		26		27		25		
13-Sep	8:42	22		22		23		23		23				
14-Sep	9:58	20		23		23		23		23				
15-Sep	11:05	19		19		20		20		20				
16-Sep	8:33	19		19		19		20		18				
17-Sep	8:55	18		19		19		18		18				
18-Sep	9:39	19		19		19		19		19				
19-Sep	9:21	16.8		16.1		16.1		16.1		16.1				
20-Sep	8:12	17.8		16.4		17.3		17.1		16.9				
21-Sep	8:29	15.8		15.7		14.9		13.2		14.2				
23-Sep	9:30	14		13.8		15.7		14.4		13.8				
25-Sep	10:09	12.4		12.9		15.7		12.7		13.1				
30-Sep	8:41	10.5		10.8		10.2		10.9		11.8				

Table I.10: Turbidity Measurements at Station SE3

Date	Time (24 hr)	Depth (m)																
		0	1	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
01-Aug	4:19	7.11												11.04				
01-Aug	10:00	9.9	11.2	11.3		9.4		10.4		9.7		12.1		13.4				
02-Aug	0:55	8.1												15				
02-Aug	4:14	7											11.8					
02-Aug	6:14	8.4										12.3						
02-Aug	9:25	10.1	9.9	10.8		8.2		8.1		8		7.2		9.6				
02-Aug	15:30	10.9	11	11		12		11		11		8.5		9.5				
02-Aug	22:08	5.4											28					
03-Aug	3:21	3.2													56			
03-Aug	5:49	6.2		7		8		9	9.5	9.5	13	30	60					
03-Aug	10:39	5.7	6.2	6.7		6.7		7.1		10.5		25.8		75				
03-Aug	14:51	6.9	6.9	6.5		6.9		7.8		12.4		63.7						
03-Aug	21:57	6.8										20						
04-Aug	1:30	5.2												23				
04-Aug	5:27	6.2												20				
04-Aug	15:50	10.9	11.5	11.1		11.8		12.2		11.2		12		11.2				
05-Aug	1:24	11.8													38			
05-Aug	6:06	12											30					
05-Aug	15:58	10.3	9.3	10.5		10		10.5		10.5		26		31				
05-Aug	22:16	6.2														20		
06-Aug	2:08	7.9																30

Date	Time (24 hr)	Depth (m)																
		0	1	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
06-Aug	14:22	23.5	23.5	23.9		24.9		26.1		28.2		31.5		34.5		40.9		
07-Aug	5:15	45												113				
07-Aug	9:29	60.5	58.3	62		60.8		59.2		76.5		112.6		104.9		61		
07-Aug	15:29	56.5	56.2	60.7		66.9		66.5		87.2		114.5		69				
07-Aug	22:03	32				50				70		110	50					
08-Aug	6:15	30						37		43		102						
08-Aug	8:43	39.1										112						
08-Aug	14:10	16.5								117								
08-Aug	17:09	7.7	11.2	26.2		28		30		60		98						
08-Aug	20:24	7.2	7	12.8		33		31.7		33.5		88	114					
08-Aug	23:02	7.7	78	78	12	29	31	28	30	33	37	42	117					
09-Aug	5:32	12.3	12.3	12.5		13.5		24.5		28.5		89.7						
09-Aug	10:26	24.1	21.9	23.2		21.7		19.5		18.8		72.2						
09-Aug	17:26	29	31	32		31		30		34		32	39	40		36		
09-Aug	17:56	38	39.3	38.5		39.2		38		38.3		39.5						
09-Aug	21:06	32.6	34.8	30.6		27		32.3		33.1		34.4		31.6				
10-Aug	5:56	38	39	38		39		38		38		39.5						
10-Aug	9:16	37.9										55.6						
10-Aug	13:51	38.1	38.2	38.7		38.2		40.2		45.7		57.2						
10-Aug	17:00	29.8	30.8	35.9		35.6		38.6		41		114						
10-Aug	21:37	21.1	22.2	28.9		30.9		37	40	44.8	47	88.9						
11-Aug	6:29	24.5	24.5	26.5		31.4		32.5		46.6		77.5						

Date	Time (24 hr)	Depth (m)																
		0	1	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
11-Aug	9:34	23.2	23.9	24		22.1		23		27.5		92.5						
11-Aug	16:03	22	23	21.5		24.5		24		23		25		7.5				
12-Aug	10:00	33	42	44		43		45		62		108		1500				
12-Aug	14:35	93	102	115		117		131		149		1500						
13-Aug	8:25	63	63	67		82		94		96		107		1500				
13-Aug	11:45	64	65	60		50		70		127		143		1950				
13-Aug	17:19	17.3	17.7	28.3		119.5		140		210		215		2700				
13-Aug	21:18	18.3	19.9	18		91.1		106		288		340		452				
14-Aug	6:55	25	26	29		29		71		132		148		1280		2000		
14-Aug	20:35	138	137	142		155		142		143		135		130				
15-Aug	22:35	114	110	112		116		115		114		115		112		116		
16-Aug	11:10	120	123	132		116		88		91		193		305		1430		
16-Aug	21:22	60	66	80		106		105		125		140		1050				
17-Aug	9:04	78	72	77		76		62		64		361		160		2300		
17-Aug	17:46	90	85	102		105		136		202		610		1150		2350		
18-Aug	9:37	95	105	111		127		127		147		1300		3200				
18-Aug	16:39	36	55	91		94		106		124		287		1540	2700			
18-Aug	21:28	80	80	81		90		91		114		179		1450		3000		
19-Aug	14:40	129	124	132		161		161		158		198		391		968		2130
20-Aug	9:38	205	155	193		188		169		171		169		181		204		
20-Aug	16:21	183	184	188		182		195		227		239		260		335	440	
20-Aug	21:00	183	187	175		180		185		190		213		220		260	1300	

Date	Time (24 hr)	Depth (m)																
		0	1	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
21-Aug	10:26	134	129	121		130		137		219		355		497		1700		
21-Aug	16:35	132	114	136		141		152		162		264		548		2100		
22-Aug	12:22	81	85	83		89		90		150		270		1000	2800			
23-Aug	13:44	81	80	90		91		114		94		96		106		260		
24-Aug	10:24	140	150	150		148		153		158		160		189		1750		
25-Aug	8:38	106	108	106		110		115		116		104		172	310			
25-Aug	15:12	91.8	83.5	89.5		68.5		68.5		111.7		120.4		162.8		350		
27-Aug	8:30	67.7	62.3	55.8		53.6		54.5		60.8		61.1		54.7		64.4		
28-Aug	8:50	48.7	41.9	47.1		48.5		48.5		45.6		55.9		55.7				
29-Aug	8:07	43.4	47.7	44.6		46.5		54.6		49.7		56.5		53.3				
30-Aug	16:47	99.1	106.2	95.4		91.6		91.3		107.2		86.6		85.5		99.8		
31-Aug	8:12	73.3	71.7	77.2		71.9		75.7		71		75.2		71.8				
01-Sep	7:59	50.5	59.9	58.4		55.7		53.6		59.4		51.7		56.6		51.4		
02-Sep	7:55	60	58.2	59.9		61.9		62.1		64		62.9		66.6		63.3		
03-Sep	8:38	54	46.1	47.9		51.6		48.6		53.6		48.1		51.8		52.4		
04-Sep	8:37	52.5	41	50.1		52.1		44.6		42.8		48.8		41.4		43.6		
04-Sep	15:49	38.6	39.9	37.3		39.2		45.3		37.8		38.1		45.9		39.5		47.4
05-Sep	8:07	37.6	48.4	49.5		47.1		50.4		49.5		48.5		47.9		45.1		47.1
06-Sep	8:14	40	39.8	36.5		40.6		37.5		36.8		39.1		38.9		42.6		
07-Sep	8:06	44	44.2	42.5		41		42.4		46.6		41.6		46.3		45.8		
08-Sep	15:41	31	31	32		30		30		32		31		34		31		32
09-Sep	9:43	33	30	33		32		30		30		32		33		29		31

Date	Time (24 hr)	Depth (m)																
		0	1	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
10-Sep	8:52	30	31	31		30		32		31		30		31		31		30
12-Sep	9:02	25	24	24		24		24		24		24		25		25		
13-Sep	8:49	22	22	23		23		22		26		25		23		24		24
14-Sep	10:01	18	18	19		18		18		18		18		18		18		
15-Sep	11:09	19	20	19		19		20		20		19		20		20		19
16-Sep	8:37	19	18	19		18		18		19		19		18		20		
17-Sep	9:01	18	20	20		18		19		19		17		18		20		
18-Sep	9:44	17	19	18		18		17		17		17		18		19		
19-Sep	9:25	17.7	16.4	15.7		17.5		18.8		17.8		17.8		16.4		17.6		
20-Sep	8:05	16.1	17.6	16.4		17.7		17.1		17.5		17.3		16.6		18.8		
21-Sep	8:35	15.4	13.4	13.3		13.7		13.3		13.3								
23-Sep	9:34	14.4	15.2	14.6		12.4		14.5		13.5		16.8		15.8		14.6		
25-Sep	10:13	14.1	13.8	13.4		13		13.4		12.3		12.9		13.1		13.3		
29-Sep	15:17	11.9	10.8	10.8		10.6		10.3		10.1		10.6		10.4		10.8		
30-Sep	8:17	8.9	9.1	10.7		9.2		8.7		8.3		9.5		10.2		9.8		

Table I.11: Turbidity Measurements at Station HVH1

Date	Time (24 hr)	Depth (m)									
		0.0	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
31-Jul	4:09	0.99									
01-Aug	9:35	1.3									
02-Aug	0:45	7.6	1.6								
02-Aug	3:55	2.1					2.8				
02-Aug	9:08	2.5						2.8			
02-Aug	15:01	3.9							4		
02-Aug	21:53	5.7		7.5							
03-Aug	3:08	3.3					3.8				
03-Aug	5:37	3			3						
03-Aug	9:45	3.5					4.8				
03-Aug	14:27	3.5						3.8			
03-Aug	21:45	4.8		5.5							
04-Aug	1:11	4.2			4						
04-Aug	5:15	3.6			4.6						
04-Aug	15:15	5.8									
05-Aug	1:03	3.8			4.5						
05-Aug	5:56	3			4.3						
05-Aug	15:07	2.8			2.9						
05-Aug	22:02	3.2			3.7						
06-Aug	1:56	2.6			3.1						
06-Aug	5:34	2.6		2.8							

Date	Time (24 hr)	Depth (m)									
		0.0	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
06-Aug	13:59	3.5			3.8						
07-Aug	5:04	3.9						5.5			
07-Aug	9:05	3.3					2.5				
07-Aug	14:49	3.6			3.7						
07-Aug	21:50	4.1					4.6				
08-Aug	5:59	5	5.4								
08-Aug	10:54	5.2					7.7				
08-Aug	13:54	4.9					7.5				
08-Aug	16:56	6		6.5							
08-Aug	20:09	7.1	6.4		8.6		3.7	4.4			
08-Aug	22:48	5.7	6.8		6.9		2.8				
09-Aug	5:11	5.8			6.7						
09-Aug	10:00	13.8									
09-Aug	17:06	7.6	7.5		7.5		7.4				
09-Aug	20:52	10.2	10.5		10.6		10.6	11.1			
10-Aug	5:37	21.1									
10-Aug	8:49	24.1			28.3						
10-Aug	13:29	18.6					21.5				
10-Aug	16:44	8.8	10.1		11.4		9.8				
10-Aug	21:22	16.6	16.7		13.5	13.8	13.6				
11-Aug	6:11	19.8									
11-Aug	15:52	10	9		11		11.5	10			

Date	Time (24 hr)	Depth (m)									
		0.0	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
12-Aug	10:25	19	21		22		22				
12-Aug	15:00	11	12		12		12				
13-Aug	8:38	21	21		28		35				
13-Aug	11:30	23	24		23		31	100	162		
13-Aug	17:02	15.7	18.7		18		13				
13-Aug	21:35	15.2	15.2		15.8		18				
14-Aug	6:35	13	13		15		15				
14-Aug	19:51	43	48		45		46				
15-Aug	22:10	43	45		42		62				
16-Aug	10:25	39	42		42		41	39			
16-Aug	21:07	28	29		27		30	35			
17-Aug	10:22	32	37		37		38				
17-Aug	17:33	39	47		41		48				
18-Aug	9:14	39	45		43		42	45	46		
18-Aug	16:25	45	48		42		40				
18-Aug	20:30	49	49		46		43	42			
19-Aug	14:25	77	77		75		71	114			
20-Aug	8:22	70	55		61		74				
20-Aug	15:56	53	59		59		60	60			
20-Aug	20:46	62	67		66		65	63			
21-Aug	8:59	46	52		47						
21-Aug	16:05	48	48		47		50	40			

Date	Time (24 hr)	Depth (m)									
		0.0	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
22-Aug	11:21	59	67		63		61	67			
23-Aug	10:30	50	55		51		48	46			
24-Aug	10:10	71	72		78		74				
25-Aug	8:25	69	69		66		69				
25-Aug	15:31	50.1	50.5		48.2		45.4				
27-Aug	9:45	57									
29-Aug	8:50	46.4	47		49.5		50.5	59.5			
30-Aug	16:13	56.6	57.9		64.4		69.6	57.9			
31-Aug	8:28	51.4	50.9		53						
01-Sep	8:34	54.2	47.3		46.1		44.4	44.6	45.1		
02-Sep	8:09	44.5	48.7		51		51.8	53.7			
03-Sep	8:51	45.7	52.6		45.4		49.5				
04-Sep	9:04	37.8	46.8		41.4		45.7	44.8			
04-Sep	16:00	26.9	31		29.7						
05-Sep	8:16	33.7	36		36.5		35.6	41.1			
06-Sep	8:24	29.2	28.2		35.3		29.9	32.6	34.3		
07-Sep	8:32	31.9	31		32.9		36.1	35.1			
08-Sep	15:30	28	24		26		26	27			
09-Sep	9:29	28	28		26		29	29			
10-Sep	8:40	29	28		28		28				
12-Sep	8:48	25	26		25		24				
13-Sep	8:33	20	20		20		22	21			

Date	Time (24 hr)	Depth (m)									
		0.0	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0
14-Sep	9:47	24	23		24		23	24	23		
15-Sep	10:57	19	19		19		18	19			
16-Sep	8:26	18	18		19		18	19			
17-Sep	8:48	18	18		20		19	20			
18-Sep	9:31	17	17		17		18	19			
19-Sep	8:51	17.6	16.3		18.7		18.6				
21-Sep	8:03	13.1	12.7		13.3		13.1	13			
23-Sep	9:13	14.1	14.3		14.6		15.4	16.8	14.6		
25-Sep	9:59	14.4	13.6		14.2		15.4	13.9	14.4	14.2	14.1
30-Sep	8:32	10.9	11.7		11.9		12.1	11.9			

Table I.12: Turbidity Measurements at Station HVH2

Date	Time (24 hr)	Depth (m)									
		0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0
02-Aug	1:25	1									
02-Aug	4:02	1.2		1.3							
02-Aug	10:20	1.8		2.1							
02-Aug	15:08	2.5							3.5		
02-Aug	21:58	1.5									
03-Aug	3:11	1.9		2							
03-Aug	5:40	2.3	2.5								
03-Aug	10:00	2.8				2.5					
03-Aug	14:34	2.8									
03-Aug	21:49	2.5			2.8						
04-Aug	1:20	2.4			2.6						
04-Aug	5:18	2		2.5							
04-Aug	15:30	2.5									
05-Aug	1:12	3.2			3.8						
05-Aug	5:58	2.5			2.7						
05-Aug	15:13	2.8				2.8					
05-Aug	22:06	2.3			2.4						
06-Aug	1:59	2.3									
06-Aug	5:38	2.4									
06-Aug	14:02	2.7				2.6					
07-Aug	5:08	2.1				2.4					

Date	Time (24 hr)	Depth (m)									
		0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0
07-Aug	9:11	2.2		2.3							
07-Aug	14:54	2.2				2.5					
07-Aug	21:54	2.5		3							
08-Aug	6:03	2.6			2.7						
08-Aug	11:01	2.8				3.8					
08-Aug	13:59	4.8				8.5					
08-Aug	17:00	2.4		2.8							
08-Aug	20:13	2.8		3.1		3.1	2.8	2.7			
08-Aug	22:52	3.6		3.8		3.1	2.5	2.7	2.8	2.6	
09-Aug	5:18	3		3.5							
09-Aug	10:04	3				3.3					
09-Aug	17:12	2.8		2.9		2.5	2.7	2.8			
09-Aug	20:56	3.3		3.6		3.7	3.7				
10-Aug	5:41	7.5		8.3							
10-Aug	8:56	5.4									
10-Aug	13:14	6				6.4					
10-Aug	16:49	5.3		5.4		5.6					
10-Aug	21:26	4.4		4.3	4.8						
11-Aug	6:15	5.8									
11-Aug	16:45	7.1	7.1	6.5		6					
12-Aug	10:35	7		7		7					
12-Aug	15:05	5		6		6					

Date	Time (24 hr)	Depth (m)									
		0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0
13-Aug	8:45	8		8		8					
13-Aug	12:08	8		9							
13-Aug	18:28	8.3		9.4		11					
13-Aug	21:45	8.6		9.09		10.2					
14-Aug	6:43	8		8		8					
14-Aug	19:46	32		32		38					
15-Aug	22:14	29.6		30		34					
16-Aug	10:30	23		25		24	24	25	25	25	25
16-Aug	20:29	27		27		26	30				
17-Aug	10:27	22		24		24					
17-Aug	17:08	29		29		30					
18-Aug	9:22	30		26		27	28				
18-Aug	15:54	37		35							
18-Aug	20:45	28		29	32						
19-Aug	15:07	53		51		50	52	63			
20-Aug	8:16	48		41		43					
20-Aug	15:24	46		47							
20-Aug	20:19	46		47		47	46	46	49		
21-Aug	8:52	51		49		46	50	45			
21-Aug	15:51	49		46							
22-Aug	11:29	46		49		48	53				
23-Aug	10:20	35		47		52	49	49			

Date	Time (24 hr)	Depth (m)									
		0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0
24-Aug	8:57	50		56							
25-Aug	7:49	51		51		50					
25-Aug	15:39	46.7		44		45.3					
29-Aug	8:59	46.7		48							
30-Aug	16:18	44.7		47.8							
31-Aug	8:37	45.6		52.9		56.4					
01-Sep	8:40	38.1		39.5		49.4					
02-Sep	8:14	45.7		46.1		46.7					
03-Sep	9:47	39.1		35.5							
04-Sep	9:49	33		30.2		29.2					
04-Sep	15:58	37.4		37.2		37.7	36.5	36.7			
05-Sep	8:42	25.1		26.1		26.7					
06-Sep	8:44	24.5		24.9							
07-Sep	8:54	27.2		32.2		31.5					
08-Sep	15:08	27		27		25					
09-Sep	8:49	27		26		26					
10-Sep	8:09	24		24		24					
12-Sep	8:22	24		26							
13-Sep	8:08	22		20		22					
14-Sep	9:14	21		21		21	21				
15-Sep	10:35	20		20		19					
16-Sep	7:59	19		20		20					

Date	Time (24 hr)	Depth (m)									
		0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0
17-Sep	8:23	18		19		19					
18-Sep	8:59	17		18		17					
19-Sep	8:57	18.5		18.5		18					
21-Sep	8:08	15		13.5		13.4					
23-Sep	9:25	14.1		13.9		15.7	15.1	13.9			
25-Sep	10:04	13.6		13.4		14.4					
29-Sep	14:54	11.8		12.2		11.9	11.8	12.7	12.4	11.7	12.3
30-Sep	8:37	12.6		11.9		11.4					

Table I.13: Turbidity Measurements at Station HVH3

Date	Time (24 hr)	Depth (m)																
		0	1	2	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	10
02-Aug	1:15	5.6									6.6							
02-Aug	4:20	5.5			8.6													
02-Aug	10:00	9.6											18					
02-Aug	15:42	4.5													9.5			
02-Aug	22:13	4.1								5.8								
03-Aug	3:32	5.6									13							
03-Aug	6:02	3.8											18					
03-Aug	11:00	4.5											22.5					
03-Aug	15:05	5.5									6.5							
03-Aug	22:01	4.7									20							
04-Aug	1:38	7.7												38				
04-Aug	5:30	8												45				
04-Aug	16:03	8.2									12.5							
05-Aug	1:31	10.8																
05-Aug	6:09	9.2														9.3		
05-Aug	16:31	6.6					7.4											
05-Aug	22:22	5.8								6.9								
06-Aug	5:07	5.1									6							
06-Aug	5:51	5.8													8			
06-Aug	14:33	10.2							11.5									
07-Aug	5:23	28																

Date	Time (24 hr)	Depth (m)																
		0	1	2	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	10
07-Aug	9:44	26.8																29.5
07-Aug	15:25	23					27.2											
07-Aug	22:17	24					28											
08-Aug	6:20	29.5											63					
08-Aug	8:53	31							60									
08-Aug	14:18	18.5			30.3													
08-Aug	17:26	8.9						30										
08-Aug	20:34	11.3	14.4	16.7	19		32.1	36.1										
08-Aug	23:13	13.3	16	18.1	17.4	27	29	32	45									
09-Aug	5:51	13.2	13.8															
09-Aug	10:47	15.5																
09-Aug	17:36	20.1	19.8	24	20													
09-Aug	21:17	23.3	21.5	27	28.3		29.8		34.1		31.4							
10-Aug	6:05	36.3																
10-Aug	9:24	25.8					30.6											
10-Aug	14:00	24.7	27.7															
10-Aug	17:14	22.2	27	24.8	27.2		30		33	51.6	88	97						
10-Aug	21:52	8.2	10.6	16.1	27		30.3		36	74	102							
11-Aug	6:41	11.9		14.3														
11-Aug	16:30	14	13.5	14.5	16.5		14		15									
12-Aug	10:30	34	36	37	37		36		35		36							
12-Aug	14:42	56	54	66	65		69		73									

Date	Time (24 hr)	Depth (m)																
		0	1	2	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	10
13-Aug	8:30	128	141	142	147		154		154		154							
13-Aug	11:55	164	132	140	155		168		121									
13-Aug	17:51	55	76.5	134.7	14		137		150									
13-Aug	21:09	28	35.5	105	141		145		161									
14-Aug	7:05	38	42	42	43		62		135									
14-Aug	19:33	130	140	145	130		138		140									
15-Aug	22:45	104	108	107														
16-Aug	11:15	67	35	82	88													
16-Aug	20:23	54	59	75														
17-Aug	10:34	60	67	68	77		89		81									
17-Aug	17:02	60	69	75	79		81											
18-Aug	9:50	98	103	102	99													
18-Aug	14:27	75	95	108														
18-Aug	20:28	79	81	79	76		90											
19-Aug	15:00	69	69	74														
20-Aug	8:08	159	163	174	180		171		182									
20-Aug	15:15	110	160	105	112		111		109		120		149					
20-Aug	20:11	120	122	123	138		137		140									
21-Aug	8:41	85	79	80	92		94											
21-Aug	15:15	84	73	71	82													
22-Aug	10:55	93	99	104	103		99											
23-Aug	13:39	113	110															

Date	Time (24 hr)	Depth (m)																
		0	1	2	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	10
24-Aug	8:42	97	110	110	113		109		123		122							
25-Aug	9:05	107	112	112	110		109											
25-Aug	14:54	78.5	72.4	73.5	97.3		115		106		102.5		101		142		187	
27-Aug	9:00	47.5		56.5														
28-Aug	9:07	39.7																
29-Aug	8:40	31.7		41.6														
30-Aug	16:04	35.7	39.1	34.9														
31-Aug	8:18	40.7	52.3	45.8	46.1		48.9											
01-Sep	9:56	26.6	26.9	28.1	28		30.9		35									
02-Sep	8:40	34.5	41.9	46.6	39.7		42.9											
03-Sep	8:31	42.5	40.3	45.4	47.9		43.9		41.3		41							
04-Sep	8:45	37.1	38.1	38.6	33.9		36		38.8		37.2		34.7		36.6			
04-Sep	15:43	35.4	35	35.8	35.4		42.1											
05-Sep	8:56	1.3	31.8	35.9														
06-Sep	9:42	31.4	32.9	38.5	32.1		37.1		32.3		31.8		38.1					
07-Sep	9:20	32.8	40.9	35.9														
08-Sep	14:58	32	33	32	32													
09-Sep	8:36	28	29	27	29		29											
10-Sep	8:02	27	26	28														
12-Sep	8:14	26	26	26	26		26		26		26							
13-Sep	7:48	23	22	22	22		22		24									
14-Sep	9:06	20.3	20															

Date	Time (24 hr)	Depth (m)																
		0	1	2	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	10
15-Sep	10:24	21	21															
16-Sep	7:50	20	20	18	19													
17-Sep	8:13	19	17	18	17													
18-Sep	8:46	20	19	17	18		19		19		18							
19-Sep	8:45	16.3	15.5	15.7	15.5													
20-Sep	7:55	16.3	15.6	16.1	16.5													
21-Sep	7:58	14.2	14.7	13.3	13.8		14.3											
23-Sep	9:40	13.4	13.2	13.7	14.2		13.7		14.7		14.5		14.1					
25-Sep	10:17	15.2	12.3	12.6	12.6													
29-Sep	15:07	11.3	11	11.2	11.8		12.4											
30-Sep	8:44	11.3	11.4	11.1														

APPENDIX II

Turbidity Observations Over Time
(July 31, 2008 to September 30, 2008)

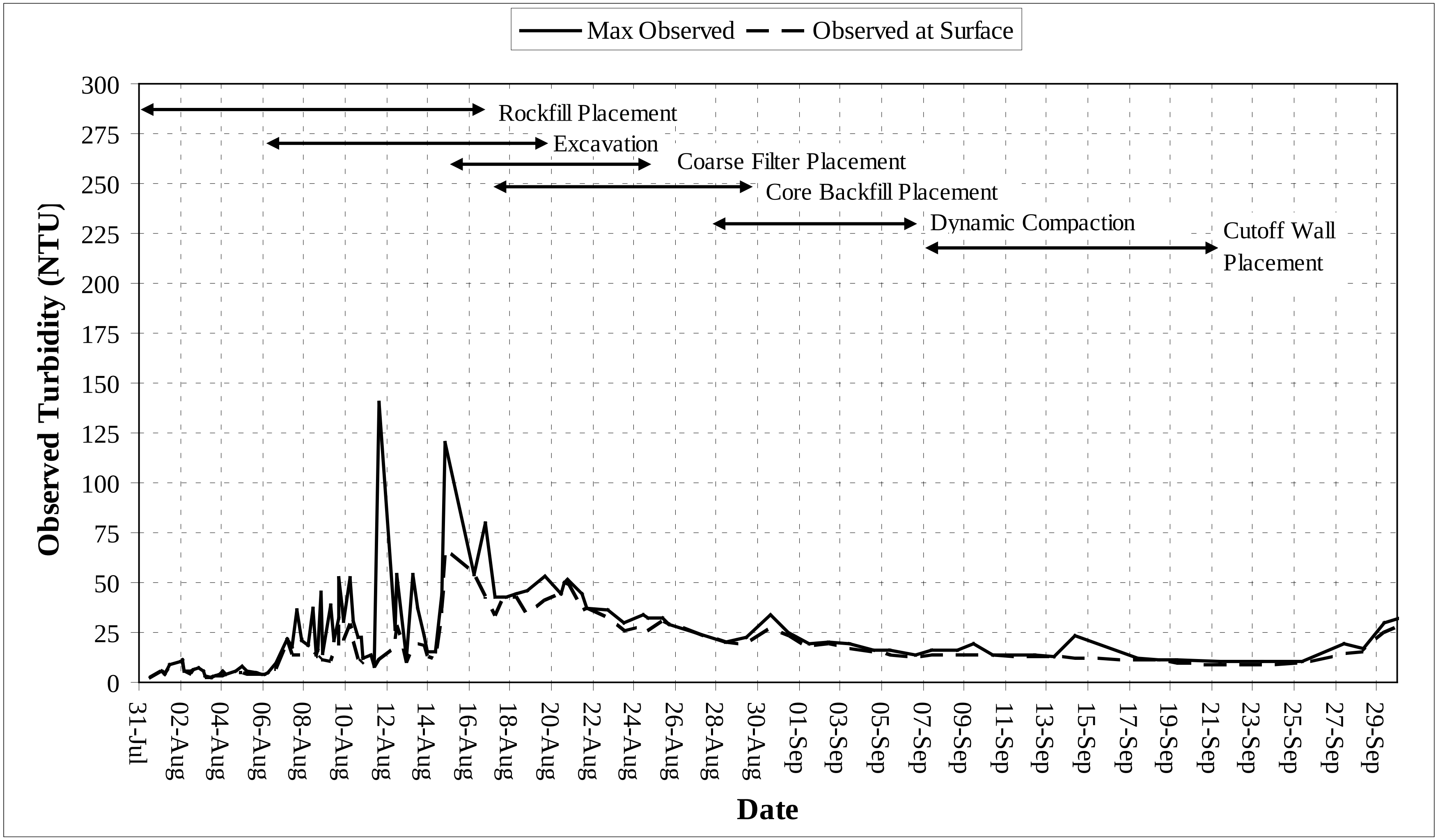

Figure II-1: Turbidity Observation Over Time at Station W1

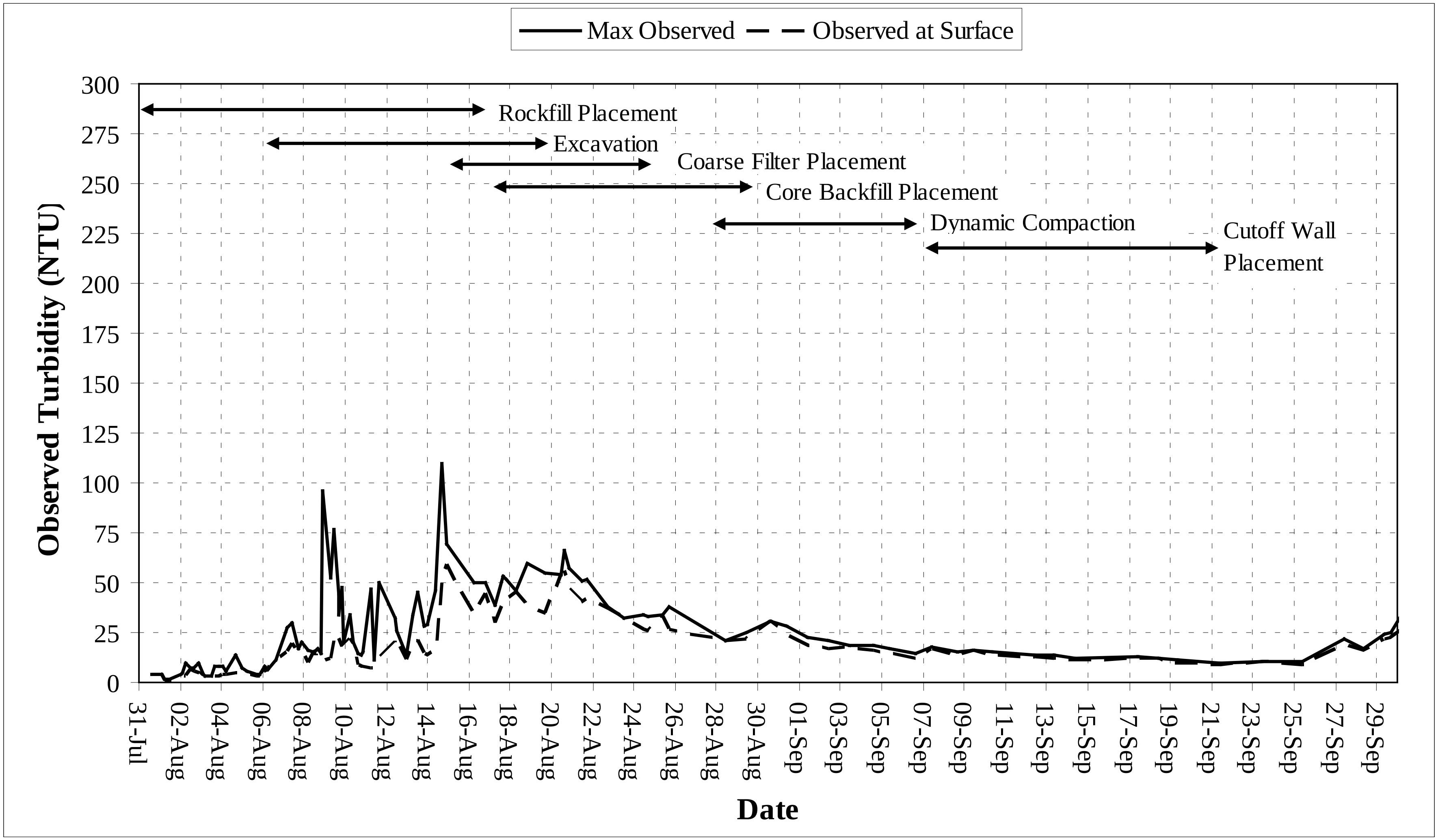

Figure II.2: Turbidity Observation Over Time at Station W2

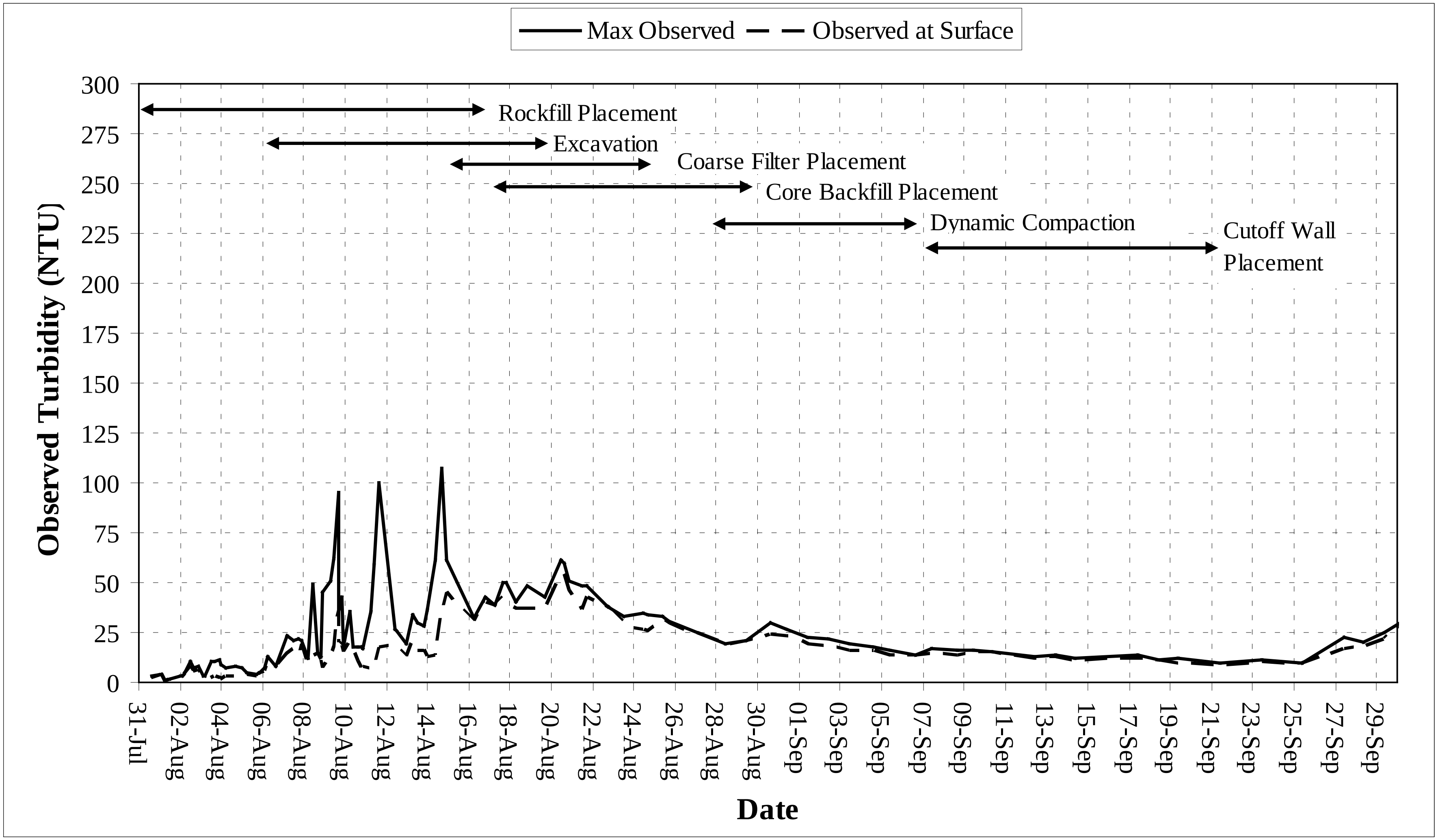

Figure II.3: Turbidity Observation Over Time at Station W3

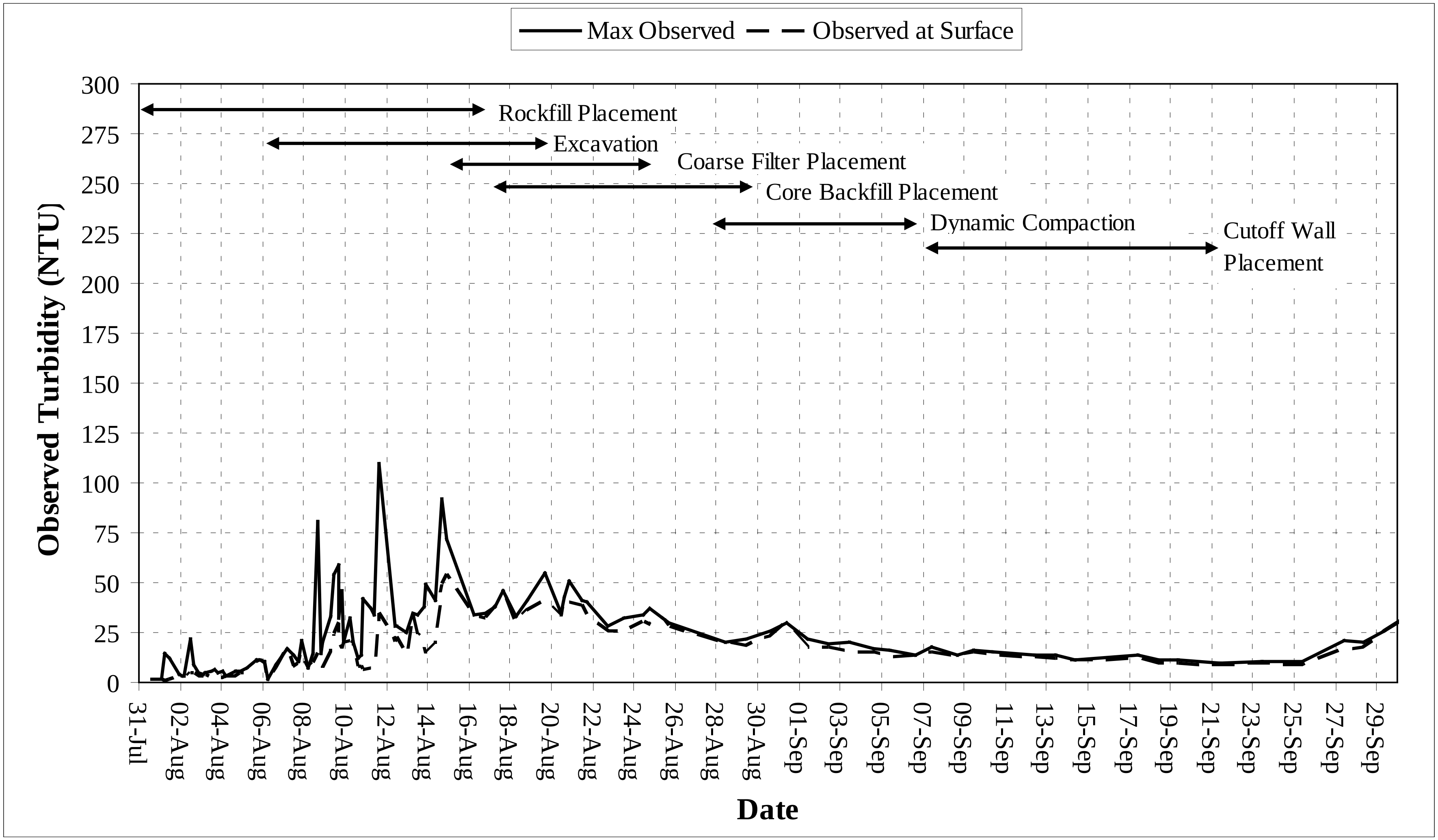

Figure II.4: Turbidity Observation Over Time at Station W4

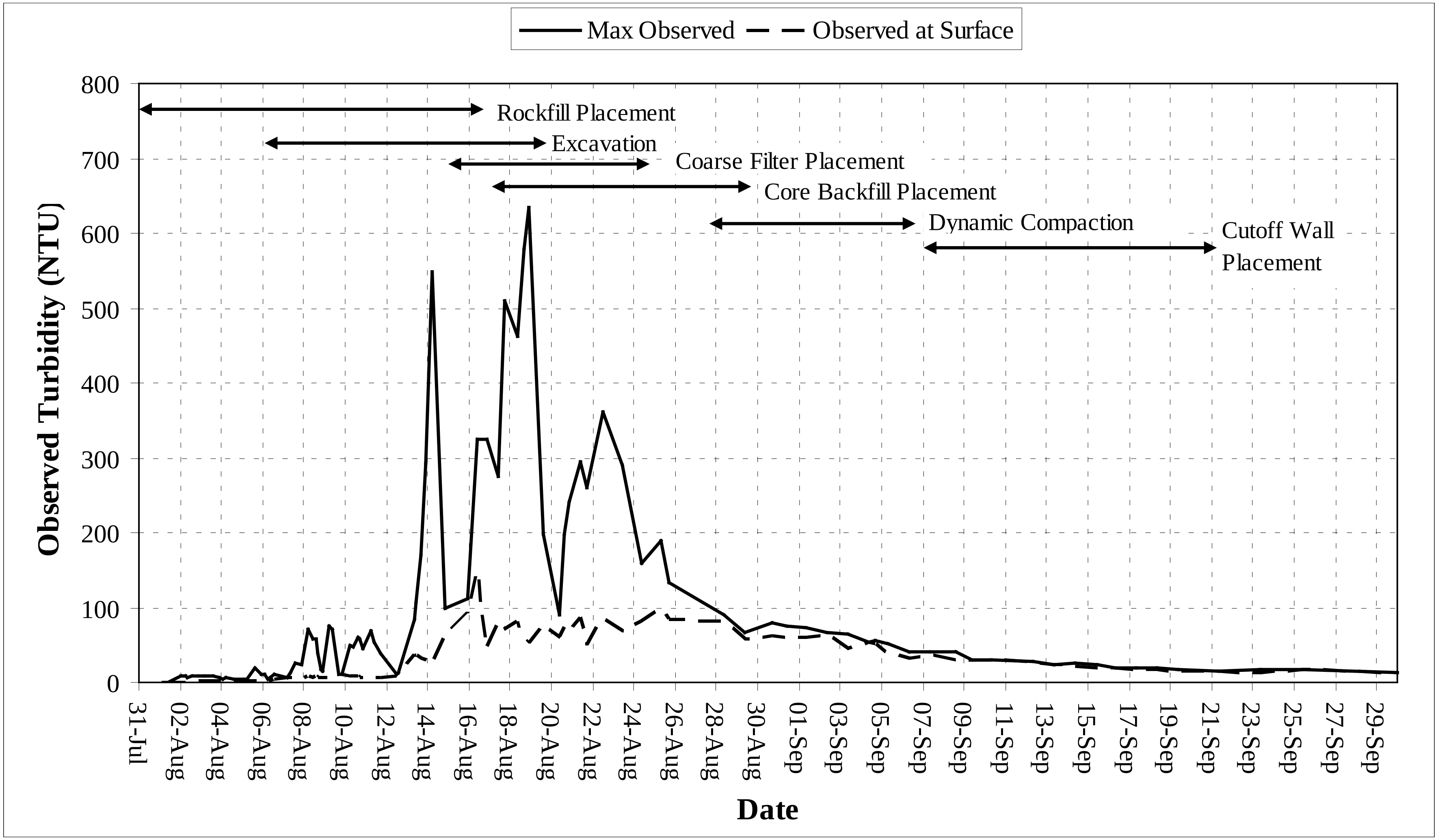

Figure II.5: Turbidity Observation Over Time at Station NE1

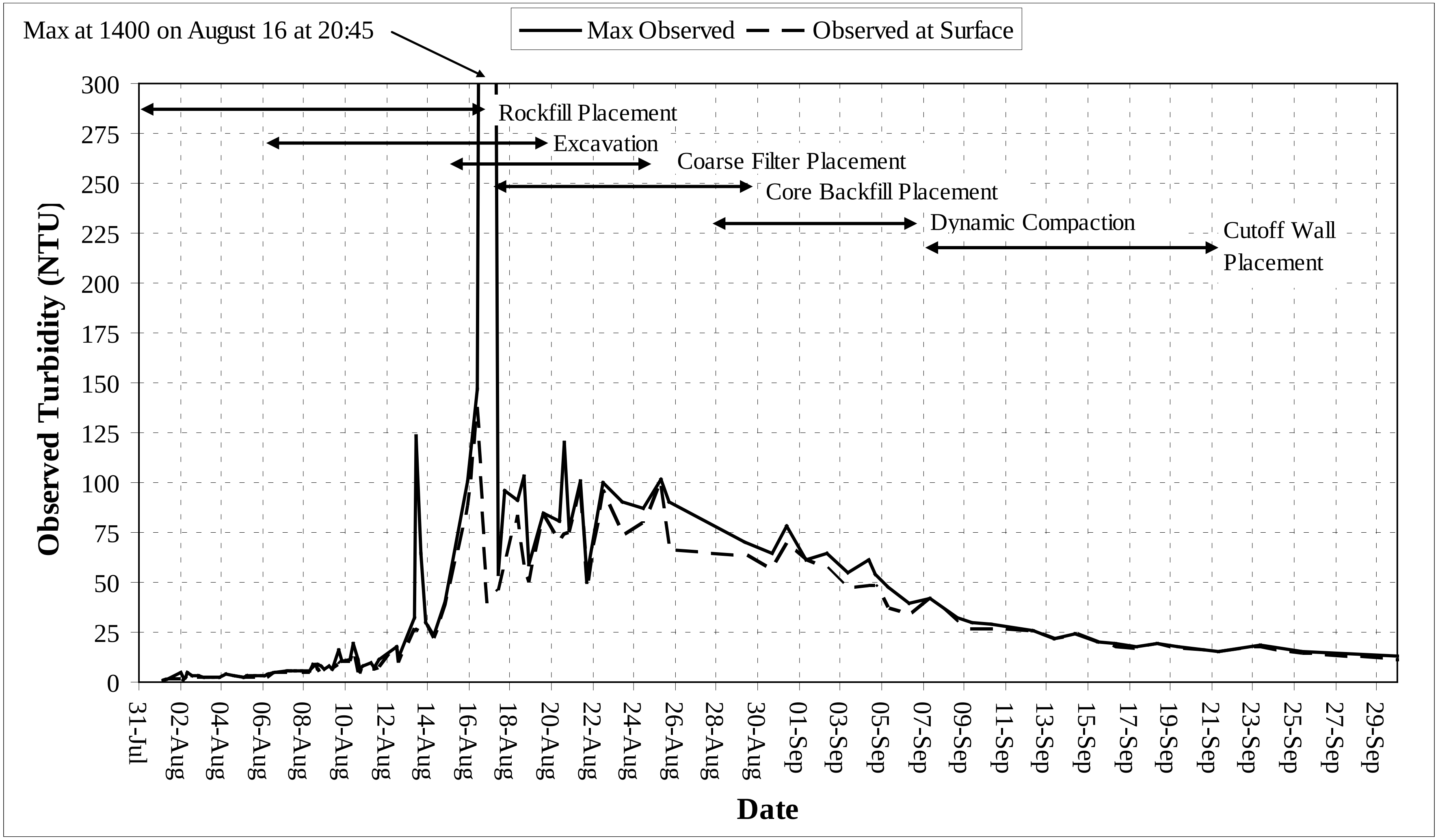

Figure II.6: Turbidity Observation Over Time at Station NE2

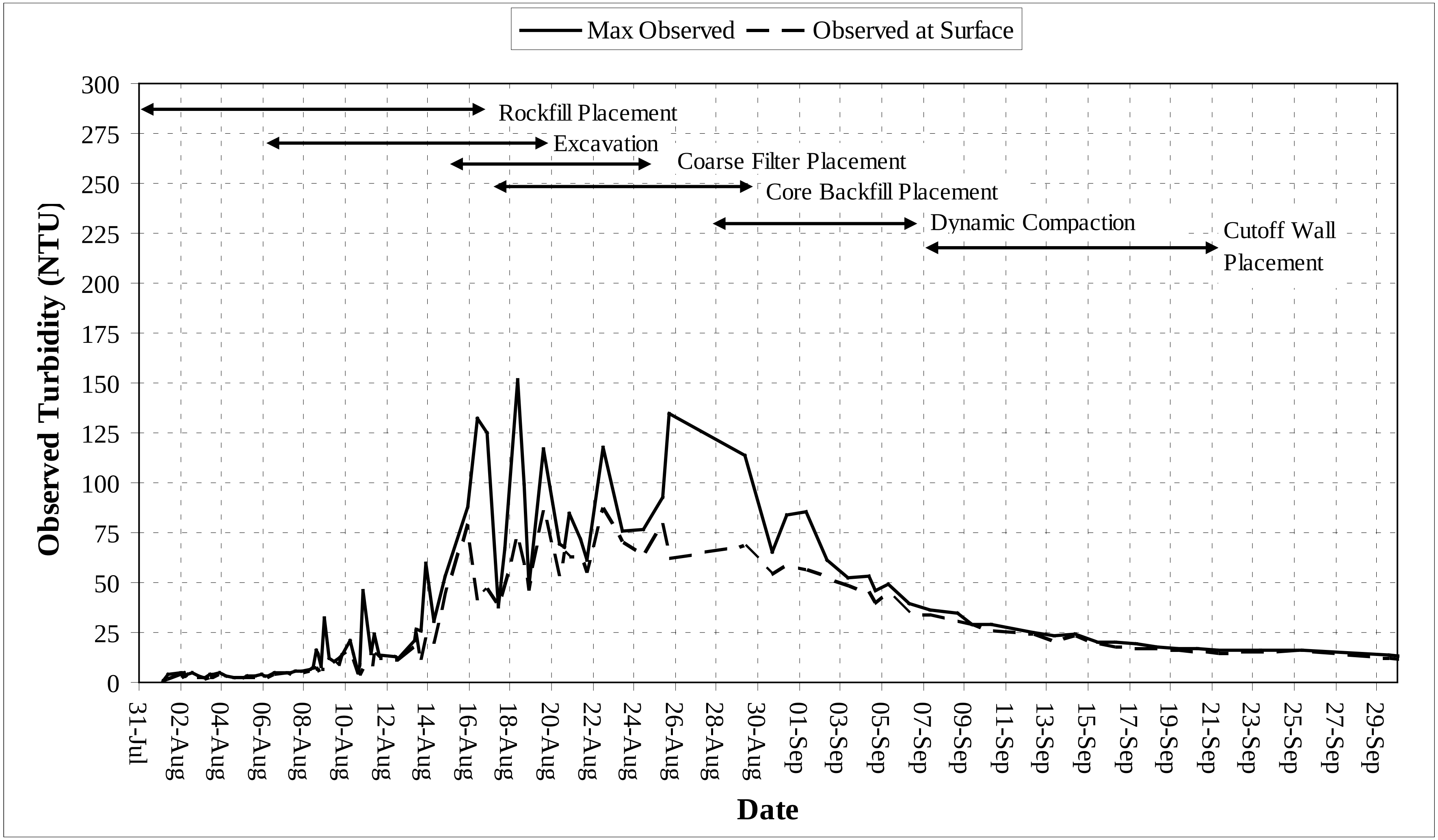

Figure II.7: Turbidity Observation Over Time at Station NE3

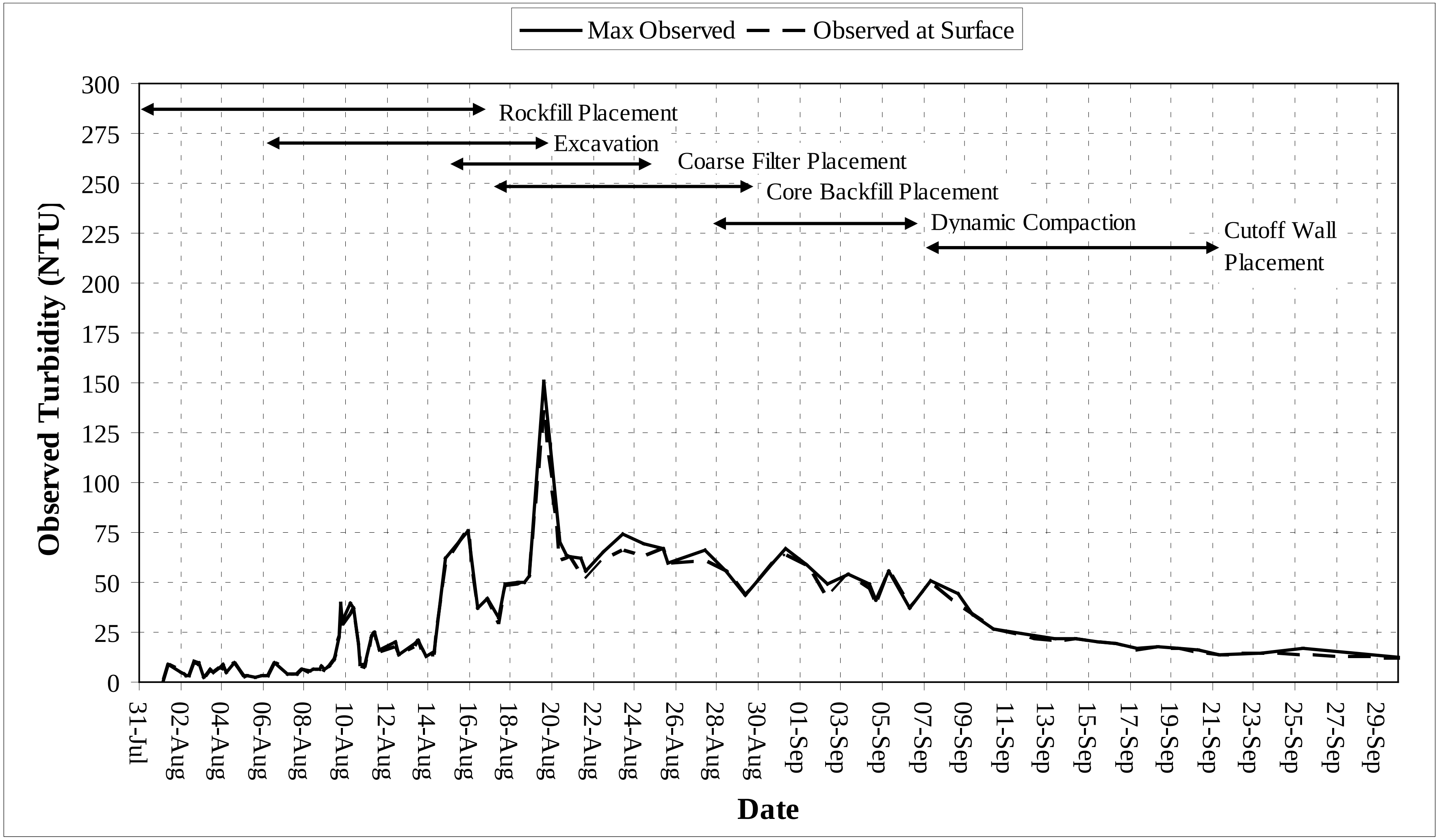

Figure II.8: Turbidity Observation Over Time at Station SE1

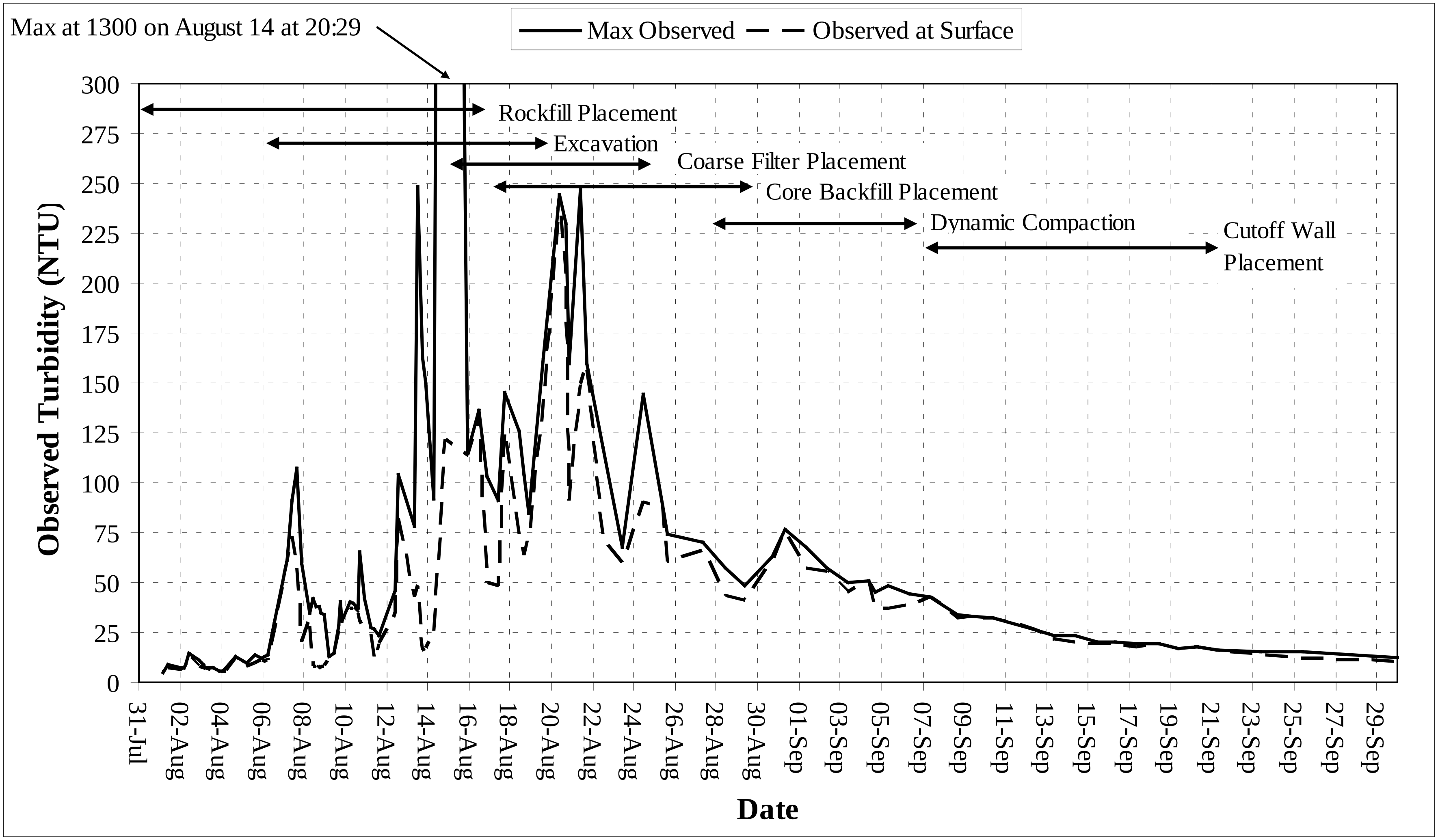

Figure II.9: Turbidity Observation Over Time at Station SE2

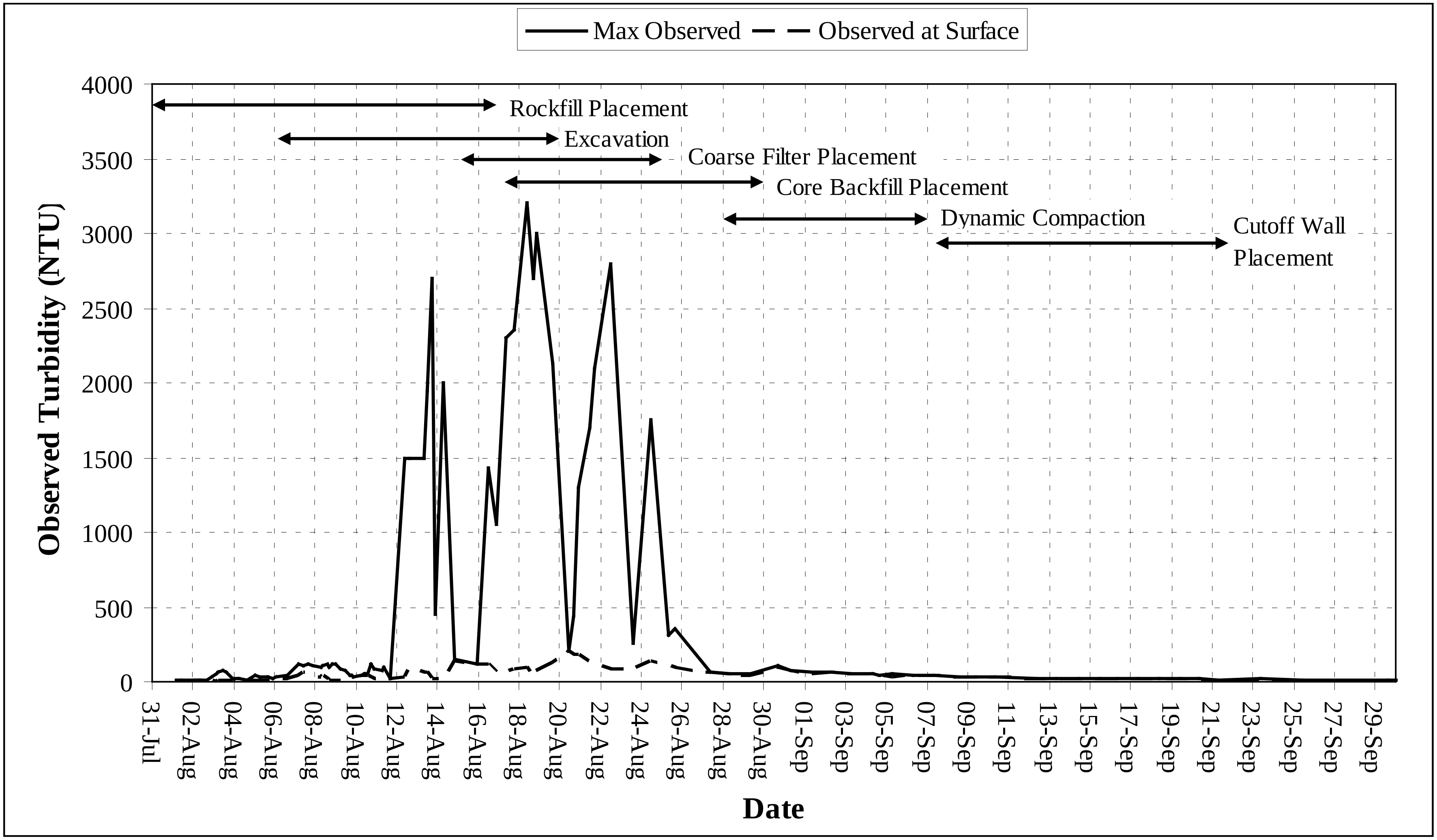

Figure II.10: Turbidity Observation Over Time at Station SE3

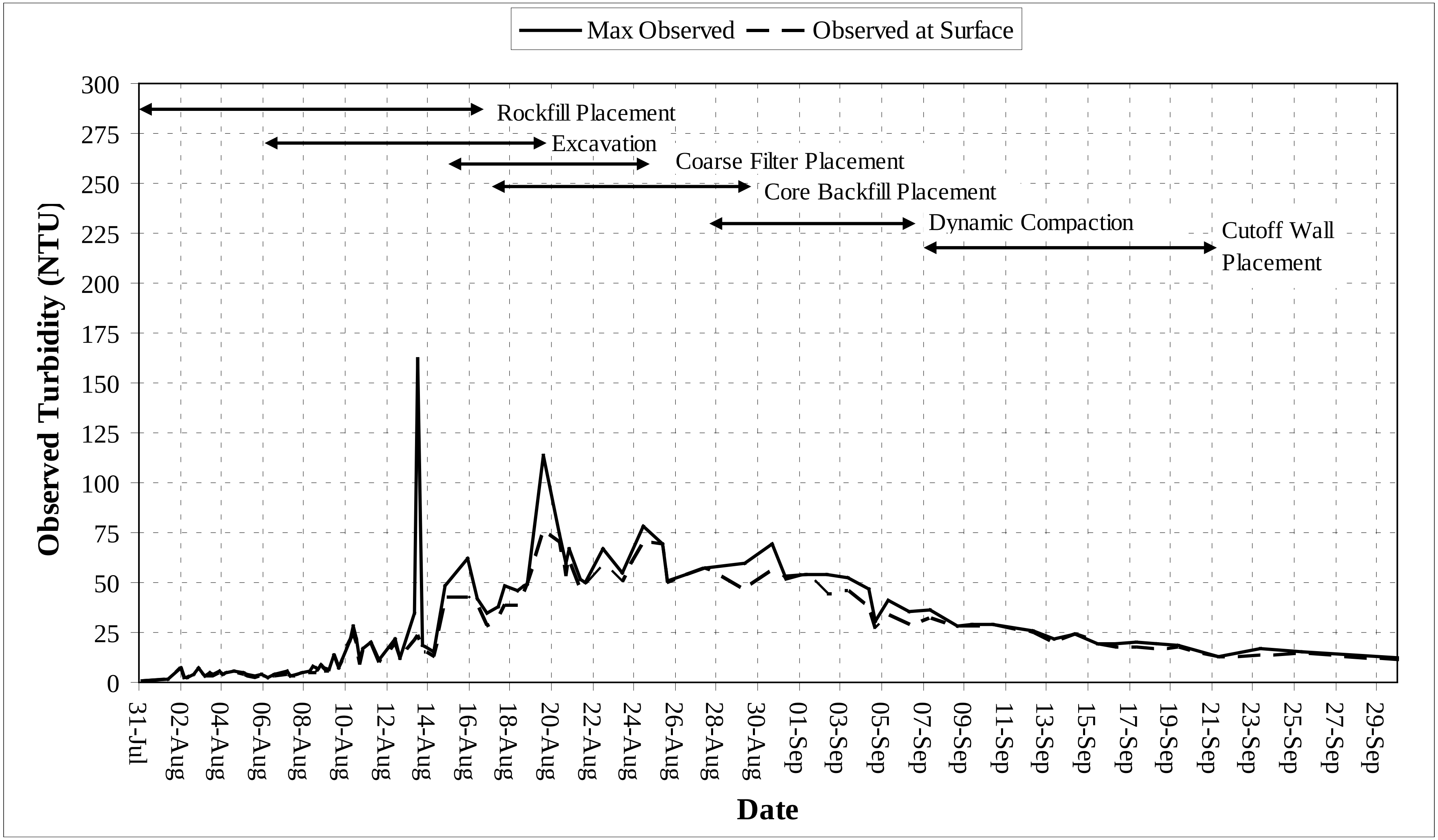

Figure II.11: Turbidity Observation Over Time at Station HVH1

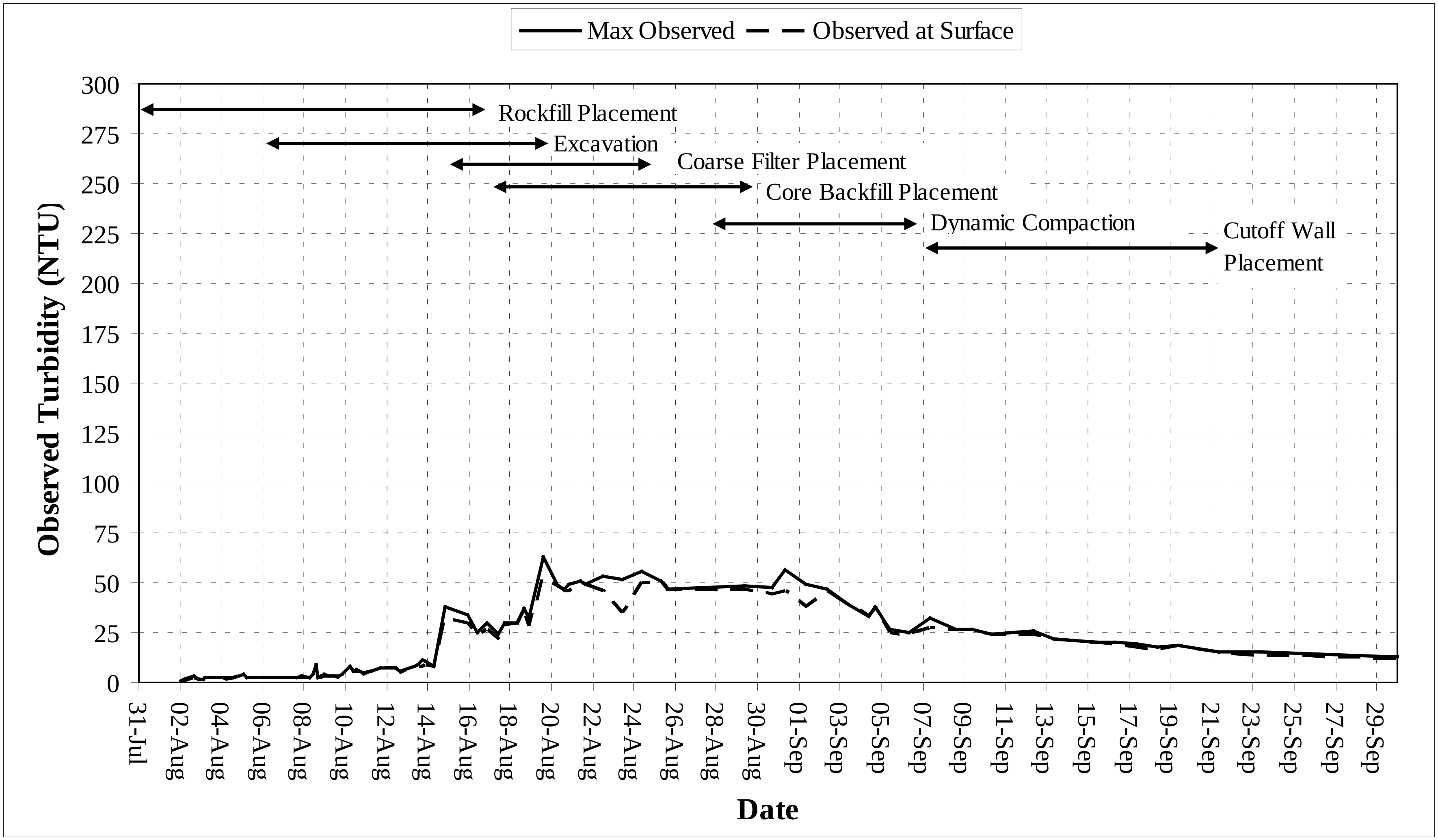

Figure II.12: Turbidity Observation Over Time at Station HVH2

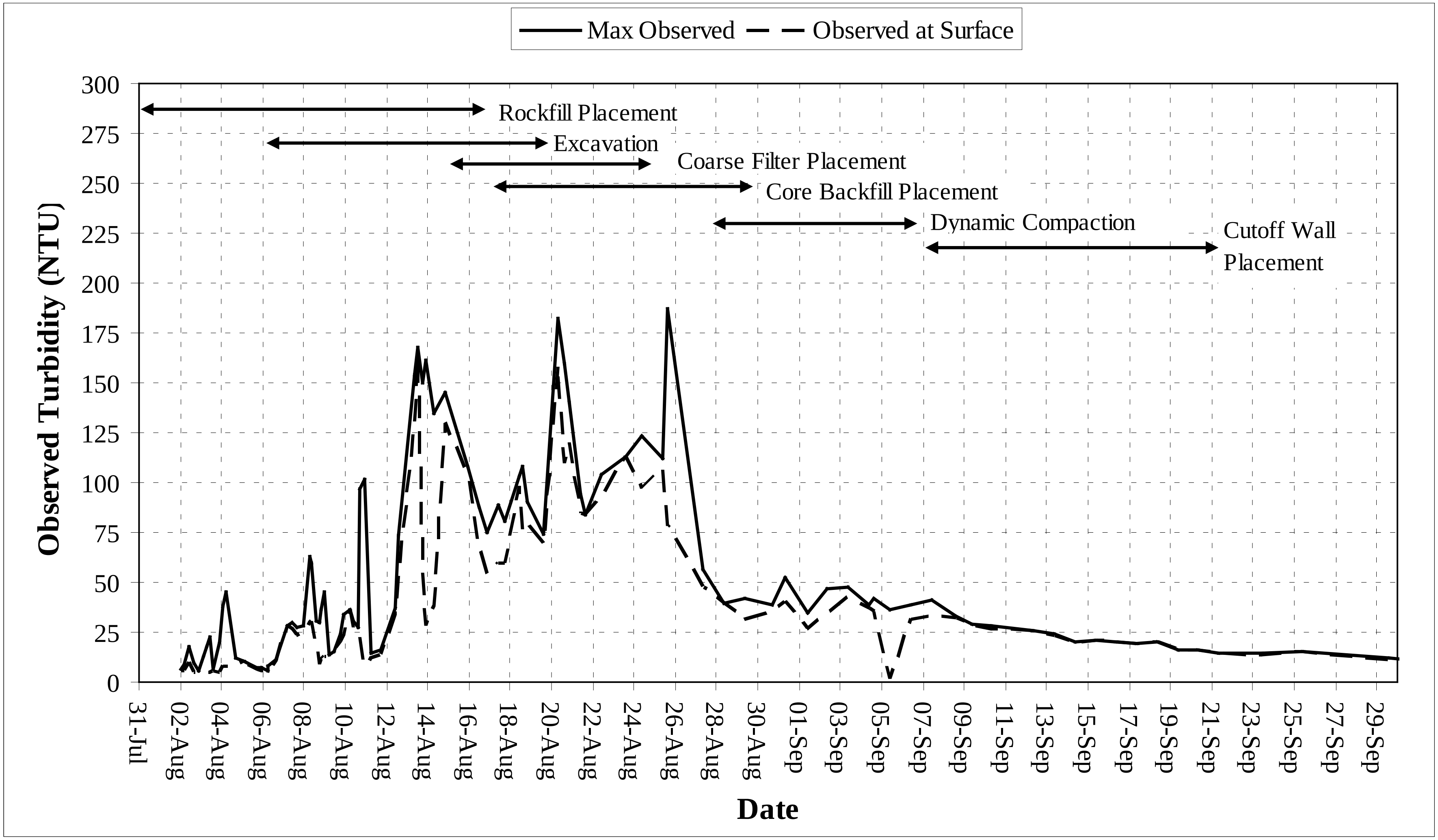

Figure II.13: Turbidity Observation Over Time at Station HVH3

APPENDIX III

Turbidity Observations Over Depth

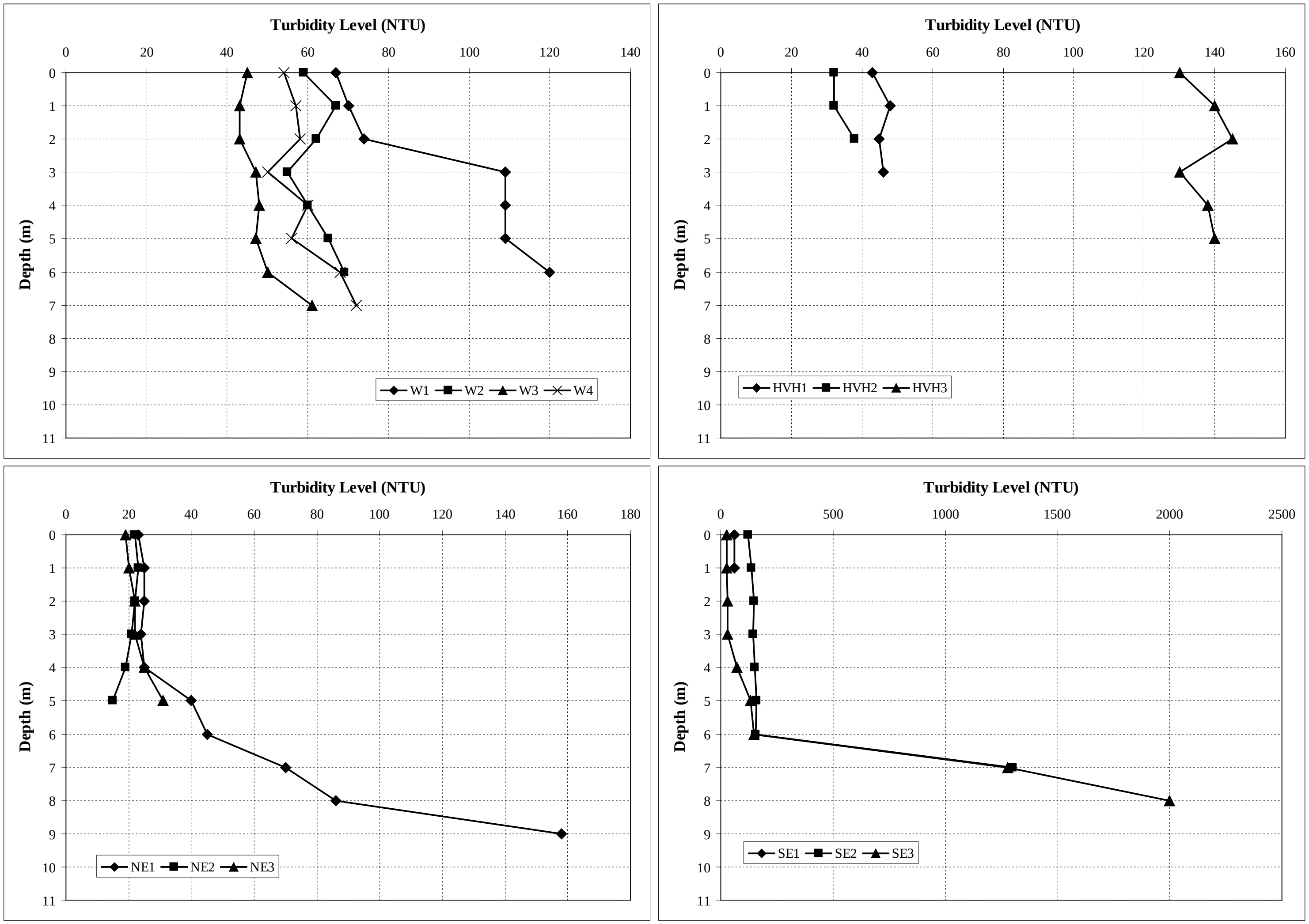

Figure III.1: Observed Turbidity as a Function of Depth on August 14, 2008

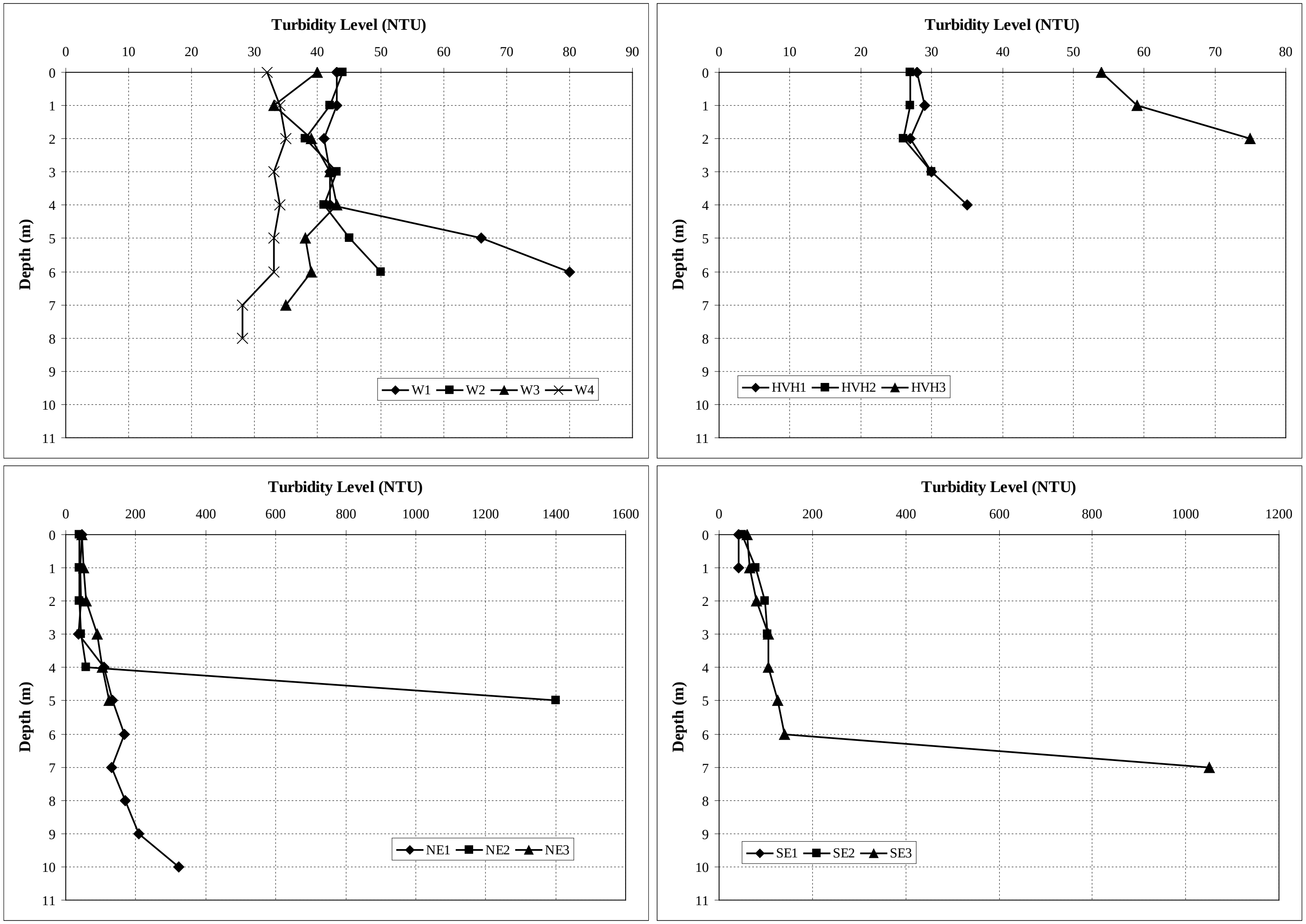

Figure III.2: Observed Turbidity as a Function of Depth on August 16, 2008

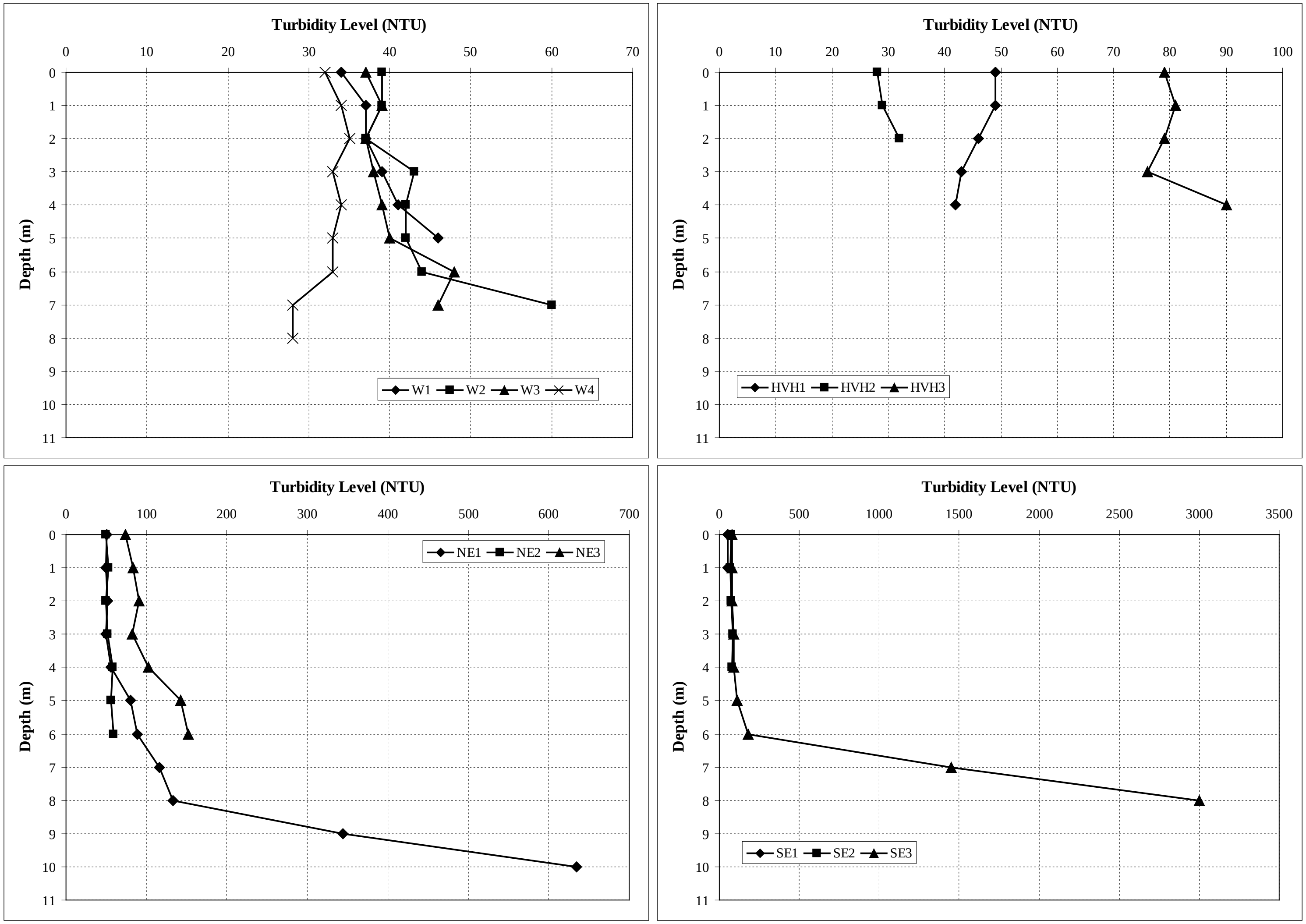

Figure III.3: Observed Turbidity as a Function of Depth on August 18, 2008

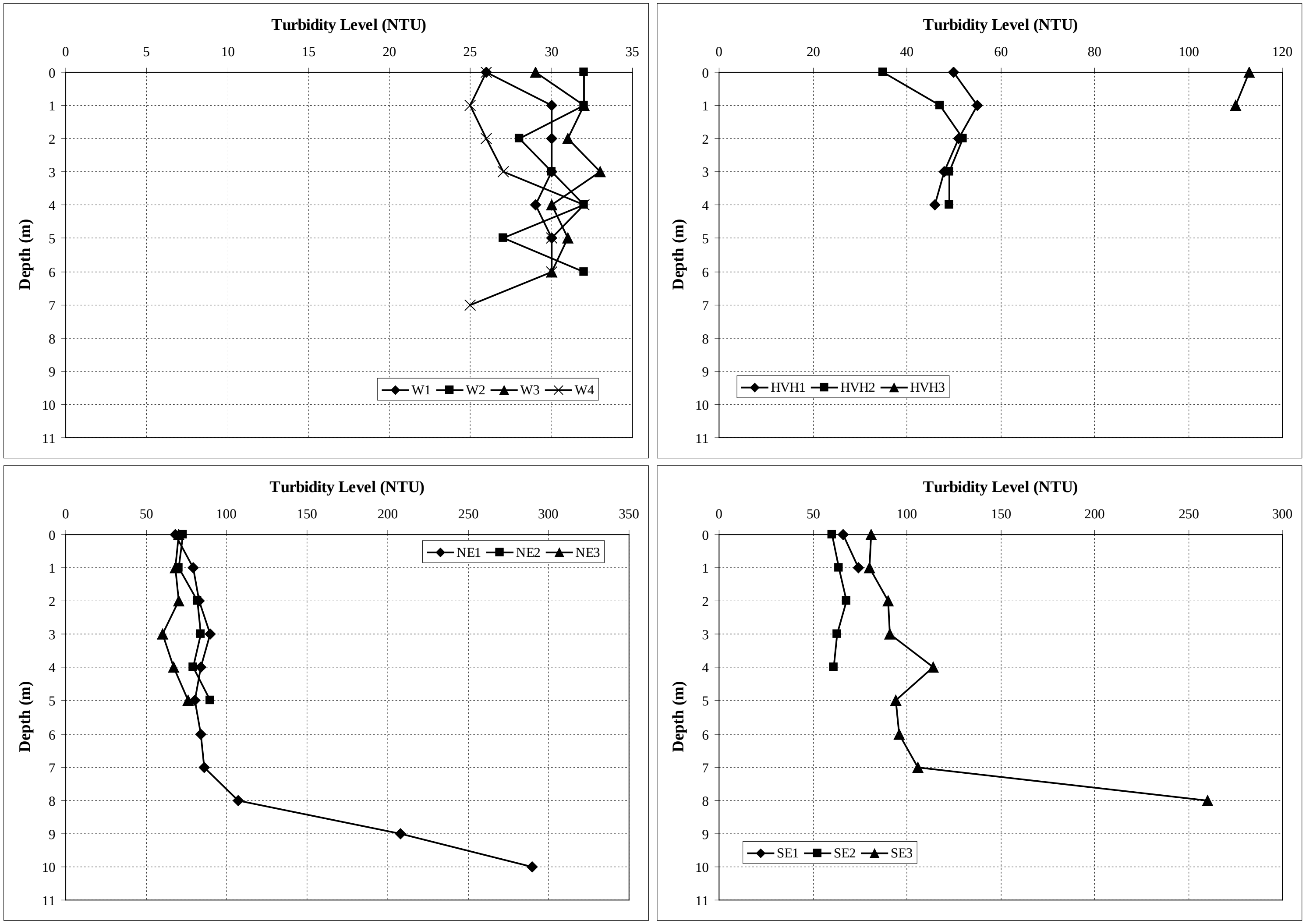

Figure III.4: Observed Turbidity as a Function of Depth on August 23, 2008

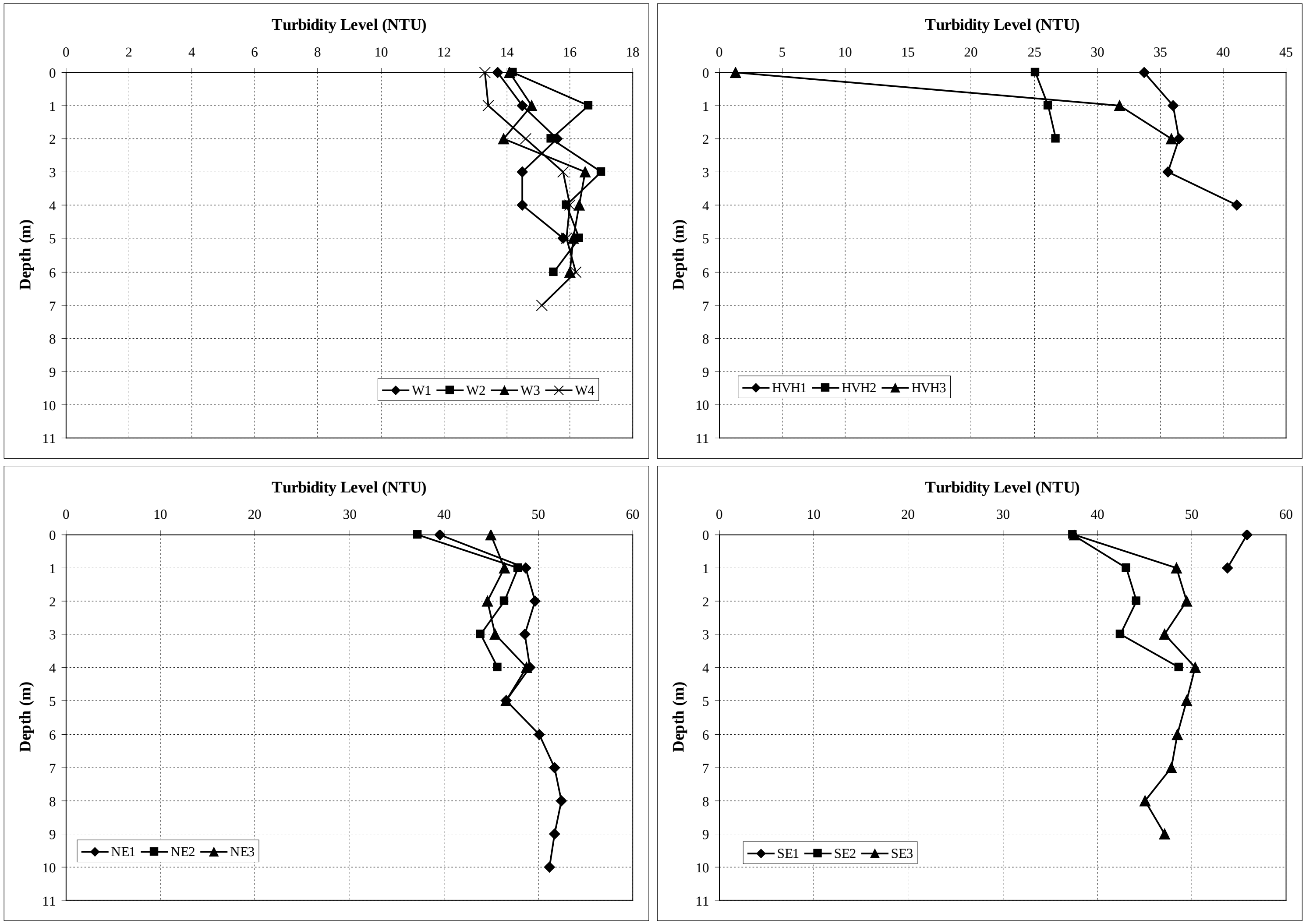

Figure III.5: Observed Turbidity as a Function of Depth on September 5, 2008

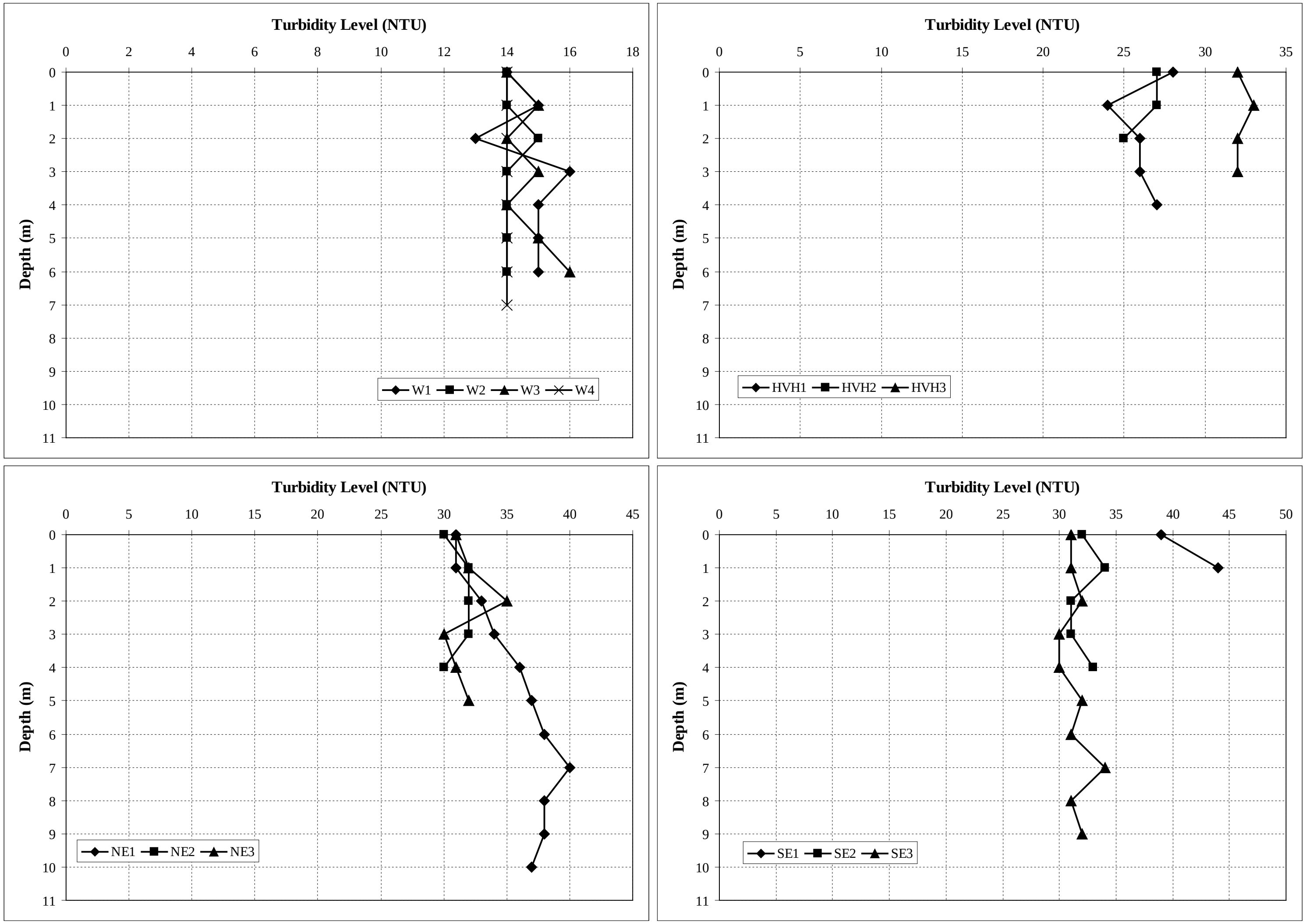

Figure III.6: Observed Turbidity as a Function of Depth on September 8, 2008

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